AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 9, No. 24. WEEKLY. | NEW YORK, JUNE 12, 1886. | $2.50 per Annum. SINGLE COPIES, 5 CENTS.

COPYRIGHT 1886, BY AMERICAN MACHINIST PUBLISHING COMPANY.

For Sale Everywhere by Newsdealers.

ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

Some New Shop Tools.

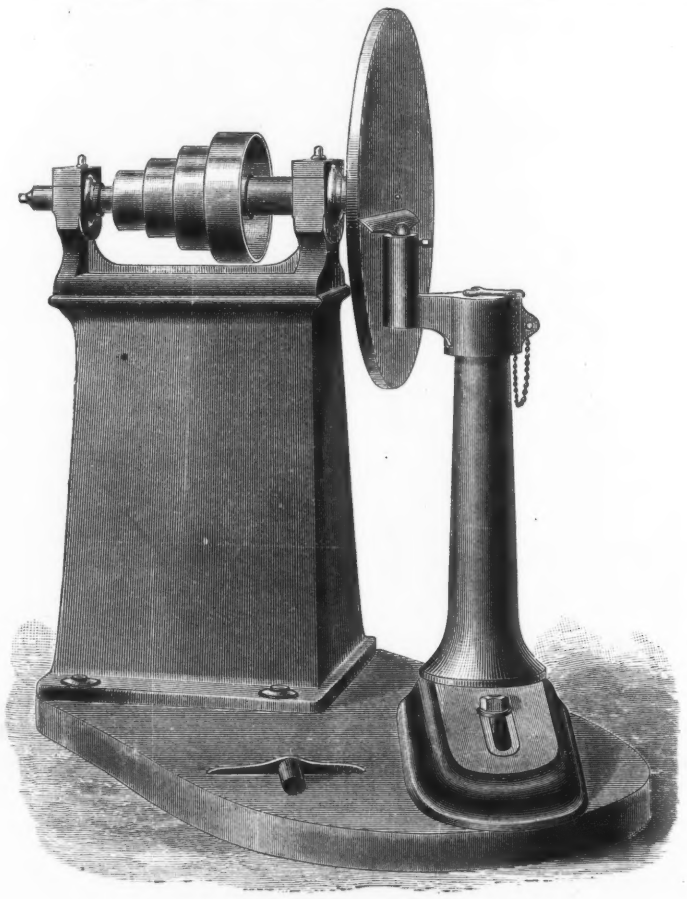
The first engraving on this page shows a new 84-inch pattern-maker's lathe. It is a compact tool. The front bearing of spindle is 3 inches diameter, 5 inches long, and carries cone pulley of four grades, the largest diameter being 12 inches for a 3-inch belt. The countershaft has 10x3-inch tight and loose pulleys. It has an adjustable rest. It weighs about 2,325 pounds.

The second cut represents a new machine for rifling gun barrels with a uniform twist from one turn in 20 inches to one in 36 inches. The cutter-rod carries from one to three cutters, as the rifling is four, five, or six to the circumference. An adjustable feed-stop gauges the depth of the rifling, and the racks, which are of steel, are double, to take up all back-lash, so that the cutters cannot ride on the lands. An oil pump feeds automatically at each end of the stroke. The carriage is gibbed on the outside of the long slide, allowing free access to its working parts.

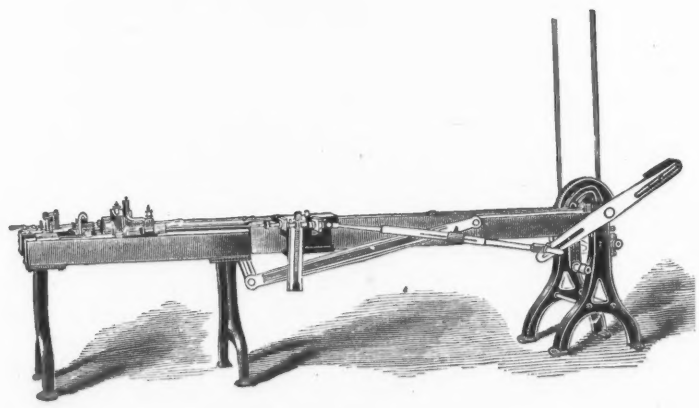
The other cut on this page represents a new 18-inch turret-head chucking machine. The head has provision for vertical and horizontal adjustment of the spindle in case its alignment with the turret holes is lost by wear.

This machine does ordinary chucking and reaming of holes much faster and better than it can be done on lathes formerly used for the purpose, and is rapidly displacing the old style machine. The usual number of holes in the turret is six, but it may be varied in building to order. The friction-clutch back-gear can be thrown in and out of gear without stopping the spindle.

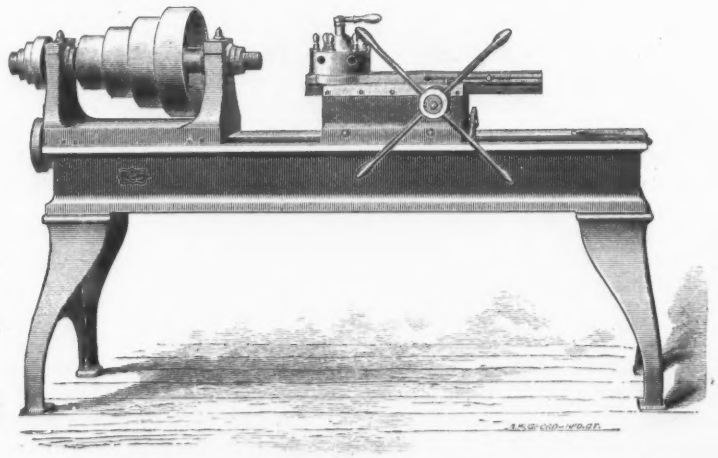
These machines are made by the Pratt & Whitney Co., Hartford, Conn.



PATTERN MAKER'S LATHE.



RIFLING MACHINE.



18-INCH TURRET HEAD CHUCKING MACHINE.

Railroad Notes from Chicago.

Every genuine Chicagoan—and people become quickly assimilated here — firmly believes, and with considerable reason, that all railroads lead to Chicago. They point to the great Northwest systems which center here, to the outlets required for these roads and for the lake traffic, and clinch the argument by pointing to the fact that Eastern roads, apparently beginning and ending within the length of a few miles, generally contrive to attach Chicago to their prospectus for the purpose of rounding up and completing it.

It is a fact that as a railroad center Chicago has no rival, and, as might be expected, important railroad shops are located here, although several large roads centering at Chicago have their principal shops located elsewhere.

CHICAGO AND NORTHWESTERN SHOPS.

Of the oldest and most noticeable shops are those of the Chicago and Northwestern Railway. These shops are probably the second in size of their kind in the United States.

The machine and erecting shop is 520 feet in length and 125 feet in width, divided by a central track. One side of the shop is devoted to machine tools and benches, while the other is entered by twenty-four tracks, leading from the transfer track, which passes between the round-house and the erecting shop. On this latter track is a steam-operated table; all that is required is to move a locomotive from the round-house on to this table, and propel the table by means of a small engine attached against the desired track leading to the erecting shop, swing into position and move the locomotive into the shop. A large proportion of the twenty-four tracks are usually occupied by locomotives undergoing general repairs. Formerly considerable work was done at these shops in the way of building new locomotives, but at present the work is almost entirely confined to repairing and rebuilding the 681 locomotives with which the road is equipped. This, of course, in many cases amounts to virtually new construction.

In the drafting room there are five draftsmen, including the head draftsman, Mr. Thompson. In the works Mr. Tilton, superintendent motive power and machinery, is assisted by Mr. Scott, assistant superintendent.

In the machine shop, while some of the tools might be called old, they are kept in good repair, and made to do good work. There are also many new tools, modern in all respects; work is systematized as much as practicable under the conditions. It is, in locomotive repairs, easy to talk of standard sizes, and not very difficult to adopt them; but keeping up to them is for the most part impracticable. It is, however, accomplished in these shops in many of the parts, as notably in driving-wheel tires. These are bored to standard sizes on a vertical boring and turning mill, and turned on the same machine, no turning whatever being done to new tires after they are in place on the wheels. This—standardizing—makes quick work when necessary in case of breakage of either wheels or tire.

Against turning the tire before they are put on the wheels, it may be urged that it is not practicable to "set" them exactly true, which is an undoubted fact, but we are informed that the variation is not sufficient to be in much of a degree objectionable.

The standard shrinkage allowed for a 57-inch (inside diameter) tire is $\frac{1}{16}$ inch; the time required to bore and turn such a tire is, at an average, ten hours. The time will, of course, vary somewhat with the quality of the tire.

About 450 locomotives are fitted with Westinghouse air-brake apparatus. In addition to the parts that are brought from the manufacturers, these require three or four men to make new parts and keep in repair. An experienced man is constantly on this work; conversation with him will assure the most skeptical that he has compassed their intricacies. They appear to be kept in excellent condition.

The two-ring packing is used in the locomotive cylinders, that is the kind in which a central bull-ring is used, with the packing rings at each edge. The packing rings are $\frac{3}{4}$ inch square, with the usual continuous spring behind to assist the spring of the packing ring (which is turned larger than the bore of the cylinder). The operation of this packing is well spoken of.

The tool room is large and well arranged. No checks are used, entries being made in a book against the workman's name, with description of the tool sufficient for identification; when the tool is returned credit is given. If a workman applies for a tool already out, in the event of his failure to get it from the man having it he must report at the tool room, or he will find it charged to him. This tool account is preserved entire for the year.

Apprentices in fair number are taken in the machine shop, and the policy of this is noticeable in the large proportion of "old hands" found in the shop. Boys appear to learn their trade in the shop and remain right along as a matter of course. In fact, the road, in all its departments, is noted for very few changes of help.

In the blacksmith shop are three large helve steam hammers and two vertical hammers, with the necessary furnaces and forges.

The car shops are on the same extensive scale as the machine and erecting shops. They are provided with all needed facilities for manufacturing, but, as a parallel to the locomotive shops, are mainly devoted to repairs on upward of 20,000 cars in use by the company. Occasionally a few cars are built, but for the most part they are bought outright.

We notice quite a number of new "Schenectady" locomotives, built in part from designs furnished by Mr. Tilton. These have cylinders $17'' \times 24''$, and 5-foot wheels. They have extended fronts and straight stacks, and generally single exhaust nozzle, the size varying from $3\frac{3}{4}$ to 4 inches. The side rods are flat bars $1\frac{5}{8}$ inch thick, $5\frac{1}{2}$ deep at the center, and tapered towards the end. They are for general service; that is, both freight and passenger.

Nearly all locomotives on the road are fitted with two injectors—no pumps. Sight-feed lubricators are being quite extensively applied, and are well liked by the engineers.

There are at present 1,500 men employed in the shops.

Modern Locomotive Construction.

BY J. G. A. MEYER.

TWENTY-SECOND PAPER.

Draw on the blackboard the views, as shown in Figs. 116 and 117; the line $b\ b_2$, Fig. 116, and the line $b\ d$, Fig. 117, must lie in the same straight line $x\ y$, because the former lines represent one and the same thing, namely, the bottom of the fire-box. The line $b\ a\ e\ k\ e_2\ a_2\ b_2$ must represent a line drawn through the center of thickness of the metal; thus, for instance, if the drawing sent from the drawing room indicates that the width of the fire-box is to be 8′ 4″, and the thickness of metal $\frac{3}{8}$ of an inch, then the width of the fire-box drawn on the blackboard must measure 8′ $3\frac{5}{8}$″, and, if the radius $g\ e$ of the outside surface of the sheet is marked 15″ on the drawing, then we must use a radius of $14\frac{13}{16}$″ on the blackboard; and, if the radius $f\ m$ for the large curve of the outside surface is marked 5′ 11″, then we use a radius of 5′ $10\frac{1}{16}$″ for the curve on the blackboard; and if the height of the fire-box at one end is to be 4′, and at the other end 5′ 2″, then the height of the same on the blackboard must measure 3′ $11\frac{13}{16}$″ and 5′ $1\frac{1}{16}$″ respectively.

In Fig. 116 draw the center line $f\ i$: through the centers g and g_2 draw the straight line $a\ a_2$. Again, through the centres $f\ g$ draw the line $f\ e$, and also through the centers f and g_2 draw the line $f\ e_2$. Divide the curved line $e\ k\ e_2$ into any number of equal parts, say ten (double this number of equal parts will give better results in actual practice—we have adopted ten for the sake of clearness), and mark the points of division 1, 2, 3, etc., as shown. Through these points draw straight lines all parallel to the line $i\ k$, and intersecting the line $e_2\ i\ e$ in the points $s_1\ s_2\ s_3$, etc. All these lines in Fig. 116 represent lines drawn on the outside of the fire-box, and will appear to be straight and parallel lines, but these lines are not straight lines, because, if a straight edge is placed upon them, the straight edge will not touch the lines throughout. These lines are curved lines; this truth can be demonstrated by geometrical reasoning, but the writer believes that, if the reader will cut a small wooden block to drawing, and draw lines upon it as explained, then such a block will not only enable him to perceive at at once the correctness of our statement, but it will also enable him to understand the whole subject better than without the aid of a block or model. Now, since the lines $1\ s_1$ $2\ s_2\ 3\ s_3$, etc., in Fig. 116, are curved lines, they should be so represented in Fig. 117, but to do so would require a great amount of labor—in fact, unnecessary labor—because we can gain nothing by doing so, and since straight lines can be drawn with very little labor, and since in this case such will not affect the shape of the sheet to any appreciable extent, we will represent the lines $1s_1$ $2s_2$ $3s_3$, shown in Fig. 116, by straight lines in Fig. 117. But still we must be very careful to show these lines in Fig. 117 in their correct positions. To do so we proceed in the following manner: Through the points 1, 2, 3, etc., Fig. 116, draw straight lines parallel to $x\ y$, and intersecting the lines $k_2\ b$, Fig. 117, in the points 1, 2, 3, etc.; also through the points $s_1\ s_2\ s_3$, Fig. 116, draw straight lines parallel to $x\ y$, and intersecting the line $i_2\ d$, Fig. 117, in the points $s_1\ s_2\ s_3$, etc.; then in the latter figure join points 1 and s_1, 2 and s_2, etc., by straight lines. Here, then, the line $1s_1$, in Fig. 117, and the line $1s_1$, in Fig. 116, will represent one and the same line; also the line $2s_2$, Fig. 117, and the line $2s_2$, Fig. 116, will represent one and the same straight line, and so on. The surface lying between the lines $e\ s_5$ and $k_2\ i_2$, Fig. 117, is one-half of the warped surface; the other half is concealed. This warped surface must be laid out first, and then the cylindrical and straight surfaces added to each end of the warped surface. In Fig. 117 prolong the line $k_2\ i_2$ towards r. Through the point e draw a straight line perpendicular to the line $k_2\ i_2$, and intersecting $k_2\ i_2$ in the point r; prolong all the lines $1s_1$ $2s_2$, etc., and intersecting the line $e\ r$ in points $r\ \ r_2\ r_3$, etc.

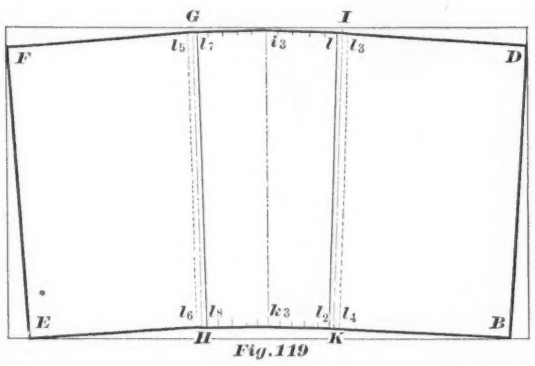
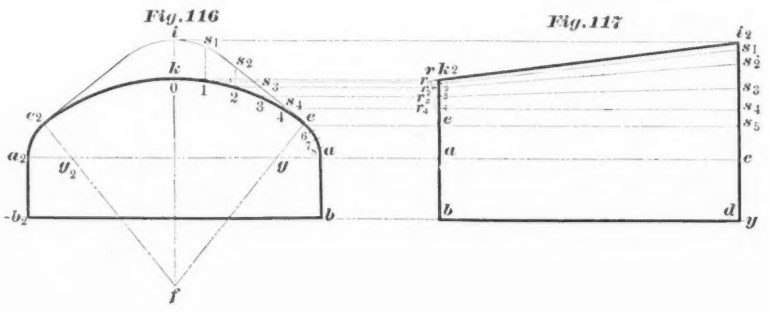


Fig. 119



Let $M\ O\ N\ P$, Fig. 118, (last week) represent edges of sheet upon which the outside of the fire-box is to be laid out. Through the center of the sheet draw a straight line $i_3 k_3$ square with the edges $M\ N$ or $O\ P$. The shape of the sheet on the right hand side of this line $i_3\ k_3$ will be exactly the same as that on the left hand side, and, therefore, it is only necessary to explain here how to lay out one-half of the sheet, although in Fig. 118 the shape of the whole sheet is shown. From the point i_3, Fig. 118, lay off a point r, the distance between the points i_3 and r must be equal to the distance between the points i_2 and r, Fig. 116. Through the point r, Fig. 118, draw a straight line $t\ u$ perpendicular to the line $k_3\ i_3$, of if the edge $M\ N$ is square with the line $k_3\ i_3$, then we may say through the point r draw a straight line $t\ u$ parallel to the edge $M\ N$. From the point r on the line $t\ u$ lay off the points $r_1\ r_2\ r_3\ r_4$ and e, the distance between the points r and r_1 must be equal to that between the points k and l, Fig. 116, the distance between the points r_1 and r_2, Fig. 118, must be equal to that between the points 1 and 2, Fig. 116; again, the distance between the points r_2 and r_3, Fig. 118, must be equal to that between the points 2 and 3, Fig. 116, and so on. Through each point as $r_1\ r_2\ r_3$, etc., draw a short straight line perpendicular to $t\ u$, and on each of these lines, and also on the line $r\ i_3$, lay off a point such as k_3, 1, 2, 3, etc., in the following manner. From the point r lay off the point k_3, the distance between these two points must be equal to that between the points r and k_2, Fig 117; the distance between the points r_1 and 1, Fig. 118, must be equal to that between r_1 and 1 in Fig. 117, and the distance between r_2 and 2, Fig. 118, must be equal to that between r_2 and 2, Fig. 117, and so on. Through the points k_3, 1, 2, 3, 4, and e draw a curved line; and in a similar manner find the points 1, 2, 3, 4, e_2, on the other side of the line $k_3\ i_3$, and through these points draw the curved line $k_3\ e_2$. From the point i_3, Fig. 118, as a center and with a radius equal to the distance between the points i and s_1, Fig. 116, describe a short arc, from the point 1, Fig. 118, as a center and with radius equal to the length of the line $1\ s_1$ in Fig. 117, describe another arc intersecting the former in the point w_1, join the points 1 and w_1, by a straight line, then this line $1\ w_1$ on the sheet represents the line $1\ s_1$ shown in Fig. 117. From the point w_1 as a center and with a radius equal to the distance between the points s_1 and s_2, Fig. 116, describe an arc, and from the point 2, Fig. 118, as a center and with a radius equal to the length of the line $2\ s_2$, in Fig. 117, describe another arc, intersecting the former arc in the point w_2, join the points 2 and w_2, Fig. 118, by a straight line, then the line $2\ w_2$ on the sheet will represent the line $2\ s_2$ shown in Fig. 117; in a similar manner find the points $w_3\ w_4\ w_5$, join the points $i_3\ w_1\ w_2\ w_3\ w_4$ and w_5 by a curved line. Next, on the other side of the line $k_3\ i_3$ find another number of points as $w_1\ w_2\ w_3$, etc., in a manner precisely the same as before, through these points draw the curved line $i_3\ w_5$. Now, that part of the sheet surrounded by the curved lines $e\ k_3\ e_2$ and $w_5\ i\ w_5$, and the straight lines $e\ w_5$ and $e_2\ w_5$, will be a warped surface, and to this we must now add, first the cylindrical surfaces and then the straight surfaces. Through the point a, Fig. 116, draw a straight line $a\ c$ parallel to $x\ y$; the line $a\ c$, Fig. 117, will represent the axis of the cylinder of which $e\ g\ a$, Fig. 117, is a portion, and since the line $a\ e$, in Fig. 117, is perpendicular to, or square with the axis, the line $a_9\ e$, Fig. 118, must be square with the line $e\ w_5$, and for the same reason the line $w_5\ c_9$ must be square with the line $e\ w_5$; therefore, through the point e draw a straight line $e\ a_9$ perpendicular to $e\ w_5$, and through the point w_5 draw the straight line $w_5\ c_9$, also perpendicular to the line $e\ w_5$. The distance between the points e and a_9 is obtained in the following manner:

Divide the arc $a\ e$, Fig. 116, into any number of equal parts, say four; also, from the point e on the line $e\ a_9$, Fig. 118, lay off four equal parts, each of these being equal to one of the parts on the arc $e\ a$, Fig. 116; the last point of division will be the point a_9. Through this point draw the straight line $a_9\ c_9$ parallel to the line $e\ w_5$. Then that portion of the sheet lying between the lines $e\ w_5$ and $a_9\ c_9$ will be a cylindrical surface. Draw a straight line $B\ D$ parallel to $a_9\ c_9$, the distance between these two lines must be equal to that between the lines $a\ c$ and $b\ d$, Fig. 117; prolong the line $e\ a_9$ to B; also the line $w_5\ c_9$ to D, or in other words, draw $a_9\ B$ and $c_9\ D$ perpendicular to the line $a_9\ c_9$. That portion of the sheet lying between the lines $a_9\ c_9$ and $B\ D$ will be a straight surface. In a similar manner find the cylindrical and straight surfaces at the other end of the sheet, and cut the sheet to the lines $B\ e\ k_3\ e_2$ E, $D\ w_5\ i_3\ w_5\ F$; also to the straight lines $B\ D$ and $E\ F$. This outline of the sheet includes the lap. The holes for the rivets should be marked off after the sheet has been worked to its proper form and placed in position; the holes should be drilled.

When the outside of the fire-box is to be made of three sheets, as shown in Fig. 114, then, for laying out these sheets, the writer would recommend the following method:

On a blackboard lay out a sheet that will cover the whole of the outside of fire-box, as shown in Fig. 118, and then divide this into the required number of sheets. Thus, for instance, let the lines $G\ H$ and $I\ K$, Fig. 114, represent the center of the lap; divide the curved line $G\ i\ H$ into any number of equal parts, say ten; also divide the arc $H\ k\ K$ into ten equal parts.

Let $B\ k_3\ E\ F\ i_3\ D$, Fig. 119, represent the outline of the sheet before it is rolled, and $i_3\ k_3$ its center line. In this figure we must first find the points G and H; also I and K, which will represent the points marked by the same letters in Fig. 114. From the point i_3, Fig. 119, on the line $D\ i_3\ F$, lay off five equal parts towards D; again, from the point i_3 lay off five equal parts towards F, each part being equal to one of the parts on the line $G\ i\ H$, Fig. 114; the last point of division on the right of the line $i_3\ k_3$, Fig. 119, will be the point I, and the last point of division on the left of $i_3\ k_3$ will be the point G. Again, from the point k_3 on the line $B\ k_3\ E$ lay off five equal parts towards D, and again from the point k_3 lay off five equal parts towards E, each being equal to one of the equal parts on the arc $H\ k\ K$, Fig. 114; the last point of division on the right of k_3 will be the point K, and the last point of division on the left of k_3 will be the point H. Join the points G and H by a straight line, also join the points I and K by a straight line; then will the line $G\ H$ represent the center of one lap, and the line $I\ K$ the center of the other lap on the sheet before it is rolled. Assume that the lap is $2\frac{1}{2}$ inches; draw the line $l\ l_2$ parallel to $I\ K$, the distance between these two lines must be equal to half the lap, namely $1\frac{1}{4}$ inches; also draw the line $l_3\ l_4$ parallel to $I\ K$, the distance between these lines must also be equal to $1\frac{1}{4}$ inches. In a similar manner draw the line $l_5\ l_3$ and $l_7\ l_8$. The middle sheet will extend from the line $l_3\ l_4$ to the line $l_5\ l_6$; one of the end sheets will extend from the line $B\ D$ to the line $l\ l_2$, and the other end sheet will extend from the line $E\ F$ to the line $l_7\ l_8$.

These lines can easily be copied on the sheets intended for the fire-box, and when the sheets are cut to these lines good results will follow.

Chestnut and cedar have been the material most in use for ties on northern railroads, but the New York Central and Hudson River Railroad are now putting in a large number of pitch or Georgia pine ties.

Pushing Manufactures Westward.

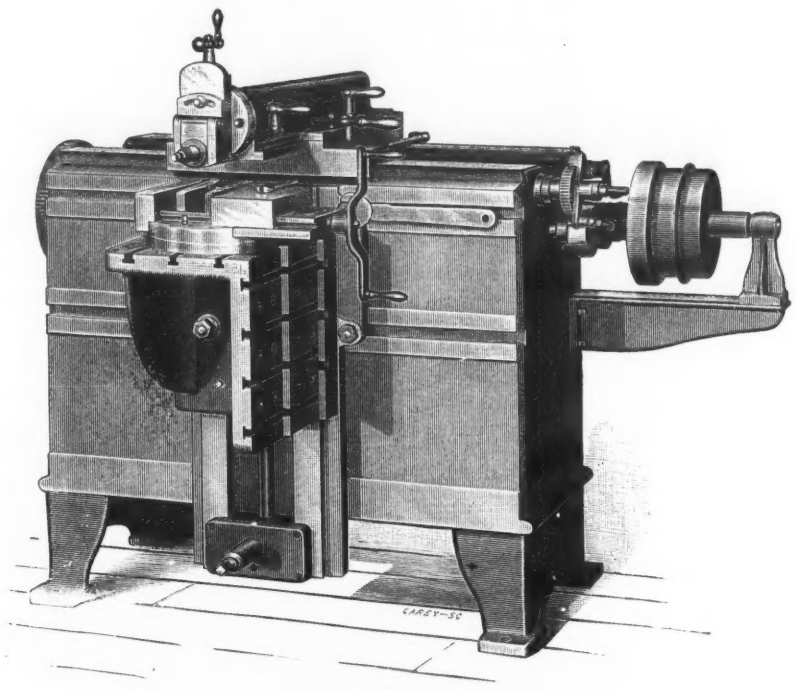
The growth of the Northwest in wealth and population during the last few years is something wonderful. Manufactures are embodied to some extent in this growth, but not nearly in as great a degree as agriculture and commerce. The development of the country east of the Mississippi and anywhere along that river is such as to sustain manufacturing industries of any reasonable size and grade. But the vast country west of that landmark (except a small strip of territory on the Pacific coast) is not yet in condition to maintain heavy manufacturing enterprises. Here and there a large one may flourish, but as a rule the successful manufacturing establishments of that section must be small yet for a few years. Some have thought differently, and being impressed by the immensity of the probable future business of that part of the Northwest have endeavored to start manufactories wholly out of proportion to the present demands. An instance of the kind may be observed in the lively young city of Fargo, Dak. A machine shop was erected there, 400 feet long and 125 feet wide, under one roof. It was equipped in part with machinery and tools, but soon the fact was made apparent that no shop of that magnitude could find profitable business in Fargo. The next step was to close the shop and offer the machinery for sale. Lately an iron and steel company has been organized with three-quarters of a million capital, and will use the building for its first operations. There is no lack of enterprise in that section of the Union, but manufactures are of slow growth in a newly settled territory.

New Shaper.

The engraving on this page represents a new traverse shaper of small size, built by the Hendey Machine Company, Torrington, Conn. This machine is designed to meet the requirements of those having a variety of large and small work suitable for a shaping machine, and want one at moderate cost. It will do the smallest class of work with accuracy, and has capacity for quite large work.

The length of stroke of cutter bar is 15 inches; traverse of cutter bar on bed is 27 inches, and will plane a piece on table 14 inches high. The table can be set at any angle. Vice can be used on either face of table.

Table can be removed and work fastened to saddle (which moves up and down on apron), or the apron can be removed and work fastened to bed of machine. A base plate can be furnished for the machine to stand on extending to the front (similar to a planer table) and work of large size fastened thereto. The finished weight of machine is 2,300 lbs.



NEW SHAPER.

Gas Engine for Launches and Small Boats.

The illustrations herewith given represent a gas engine for small boats.

This motor expands naphtha vapor for power, and uses the same vapor in part for fuel. As shown in small cut, the engine occupies only 18 inches in the stern of the boat. The 2 horse-power motor weighs 200, and the 4 horse-power 300 lbs. It is also claimed that but two minutes are required in which to get under way, and that the boat can be stopped when at full speed within its length.

No steam is used, and no license or engineer is required. When landing, close naphtha valve *D*, injector valve *C*, and the pressure will go down at once.

When the engine is to be started the alcohol lamp *A* is lighted and placed on rest plate with tube inserted at bottom of retort. The air valve *B* is opened, and gas is forced from tank through outlet pipe to burner by a few strokes of hand pump *E*. The lamp flame ignites gas and heats retort.

The naphtha valve *D* is opened and the liquid pumped from tank to retort by the pump *F*.

The naphtha is vaporized in the retort on top of engine, and by opening injector valve *C* vapor is supplied to the burner. A few turns must be given the governor wheel *G*, after which the engine will run itself.

Pressure and speed are controlled by valve *C*, and lamp can be removed.

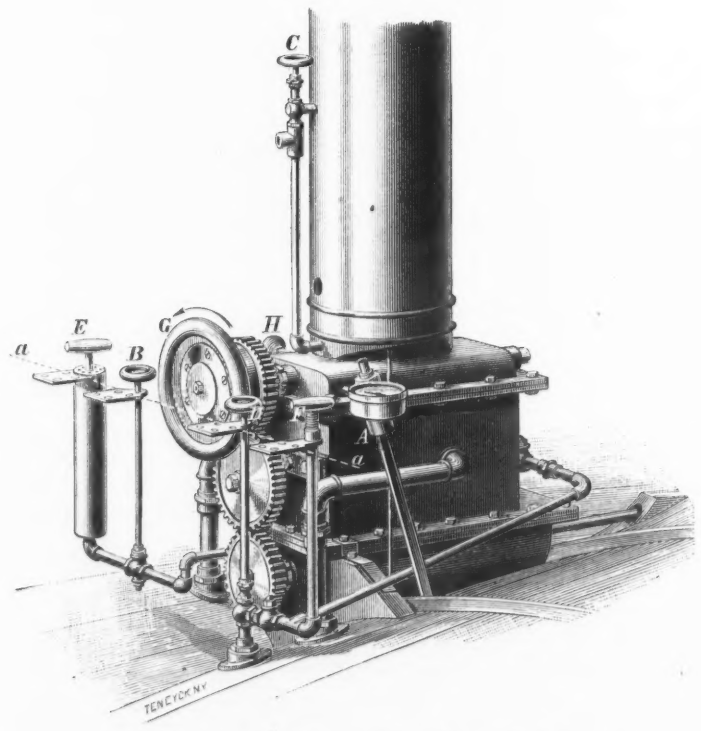
The engine can be instantly reversed by turning governing wheel *G* to the left to go ahead, and to the right to reverse, which can be done instantly at full speed.

H indicates the safety valve. Deodorized naphtha of 76 Baume is used for fuel and vapor.

A 2 horse-power engine will consume from three quarts to one gallon of naphtha per hour, and will in an 18-foot boat carry six to ten persons, and develop a speed of six to eight miles per hour.

These engines are manufactured by the Gas Engine and Power Company, One Hundred and Thirty-first street and Brock avenue, New York City.

GAS ENGINE LAUNCH.



GAS ENGINE FOR LAUNCHES AND SMALL BOATS.

Soda Ash for Cleaning Boilers.

In reference to this W. B. Cogswell, manager of the Solvay Process Company, of Syracuse, N. Y., writes us:

"In Questions and Answers, No. 209, you say soda ash is not as good as the ordinary soda of commerce. What does this mean?

"We make soda ash of 98½ per cent. carbonate of soda, about 140 tons per day. Soda ash of this purity is the best material for removing scale from boilers where the scale is composed largely, or as it is in this vicinity almost entirely, of sulphate of lime, and, as it costs only 1½ cents per pound, it is much the cheapest.

A good plan to clean a boile , if badly scaled, if it can be spared from t , is to put in a quantity, say 1 lb. for each horse-power of the boiler, and keep the boiler under steam, say, 40 or 50 lbs. pressure, and let it remain so for 24 hours and then wash out. If this don't answer, try another dose. We use in our boilers here about one-quarter of a pound per horse-power per 24 hours, and have little or no trouble with scale. We blow a little every six hours. We have 3,000 horse-power of Babcock & Wilcox boilers. The quantity of soda carbonate to be used can best be determined by analysis of the water. Every unit of sulphate of lime in the feed water will require 80 of soda carbonate.

In casting locomotive cylinders, how to avoid shrinkage at the junction of arch and cylinder wall is a serious question. The cavity formed by shrinkage in this place clearly resembles that formed by gas from an ill-vented core. Casting under pressure from a considerable heat of iron has been found beneficial, but with the utmost care quite a number of cylinders are lost from this cause alone.

Sometimes the cavity extends into the port and is easily detected, but often the extent of the bad place can only be determined after the cylinder is broken up.

The Know-it-alls in technical literature, more especially that part of technical literature which pertains to steam engineering, steam engines, boilers, etc., are legion, and their number is increasing daily. What they would do if they did not have some medium through which to "blow-off," as it were, their high pressure wisdom, it is difficult to say; probably the community would suffer more than it does now, if such a thing be possible. One of the most amusing things is the ease with which some of these chaps handle the subject of the expansion of steam. People who have studied this matter thoroughly, and have made many careful experiments, are ready to admit that there is yet something to learn about it, but the case is far different with some others. Only a short time ago one of them gave utterance to the following: "Why! I thought that any one who had studied this matter at all (referring to the expansion of steam) knew all about it!" It is safe to say that a man who would make such a statement as this, knows nothing about it himself.—*The Locomotive.*

An Association of Newspaper Men.

There are undoubted benefits to be obtained from associations of men following the same occupation. This is just as true of those engaged in mental as in manual labor. In 1872 James Pooton got a few editors and reporters of daily newspapers in this city to meet and organize the New York Press Club. The strife between daily papers to anticipate each other in securing important news was as lively then as it is now, but it was not always conducted in the same courteous manner as now. Mr. Pooton says reporters representing different papers used to place all sorts of stumbling blocks in each other's way, and in close contests to secure a "beat" would even snatch manuscript from each other's hands and destroy it. Association in the Press Club soon buried that spirit of disagreeable rivalry, and it exists no more. The club grew and extended its benefits, but strange as it seems the proprietors of the great daily newspapers all held aloof, and looked upon the Club with suspicion. They seemed to nurse their individual jealousies and would not come together even in a club composed entirely of newspaper men. The only proprietor of a prominent daily newspaper in the membership of the Club, now comprising over 500 men connected with the daily, weekly and monthly papers, is Joseph Pulitzer, who came to New York three years ago and bought the *World*. Not being troubled with any of the crotchets that possess the owners of other leading metropolitan dailies, he promptly joined the Club when asked, and has since made two liberal donations to the Club for charitable purposes. The Press Club has four large well-furnished floors of a building on Nassau street. It has rooms for work, for amusement, for refreshment and for its library. The latter contains a valuable collection of newspaper files. The Club extends its charity to many needy newspaper men who are not members and never have been.

Opinions and Statistics.

From the Mining Herald.

It seems not only probable now, but almost absolutely certain, that the efforts which, at a great sacrifice the laboring men of the country have put forth to lessen the hours of labor will prove fruitless. In the West they have gained nothing, and elsewhere the strikes have been equally barren of results. The bald truth is they have gained nothing, while the losses sustained cannot be even approximated.

From Bradstreet's.

Total reported striking for shorter hours	150,000
Total reported last week	6,000
	156,000
Total securing shorter hours without striking	111,000
Total reported last week	32,000
	143,000
Total number engaged in the short hour movement	299,000
Total to whom shorter hours were granted after striking	35,000

Recording Tool Defects.

When you buy a new tool keep a record of all the defects you find.

Supposing it to be a new lathe, note down the fact that you find a set-screw which the wrench will not fit, a steady rest which is not steady, or a spindle which does not run true.

The maker of that lathe, if he is a live, honest man, will thank you heartily for such a list of defects, for it gives him a chance to correct them in future tools.

A machinist lately called our attention to a lathe from a well-know tool builder. The lathe in question had a list on record of twenty-eight defects, and yet that lathe was considered a good one.

Patterns for Screws.

BY F. W. BARROWS.

Whether we make the pattern with or without cores will depend on the shape of the thread. If you can draw the pattern in a horizontal position with the thread cut on its surface, it is better to do so, and you will be likely to get a smoother casting. I will consider several different shapes of thread, some with cores and some that can be made without.

We have first a drum having a thread or spiral groove cut on its surface as seen in section at *a b*, Fig. 20. It is impossible to draw this pattern horizontally with the thread cut into the pattern, because there would be a good deal of back draft as shown at *c*. This drum is for winding a chain and the groove is to prevent the different turns from riding over each other, and also to lay them smoothly and tightly on the drum as at *d*. This will prevent any uneven motion in hoisting, which might be caused by the chain slipping or rolling over.

So we will have to make this thread with cores. We first turn up a straight, round piece to the largest diameter of drum, and part it through the center as is customary with nearly all patterns. Make a line around one end, while in the lathe to lay off the spiral form, and be careful to place the centers exactly in the joint or parting in order that the two halves of pattern may be alike. Then by spacing from the line of joint you may draw lines parallel with the axis of drum, dividing the surface into four, six or eight different parts, according to the size of the cylinder and the pitch of the groove. If the pitch is coarse or steep make more parts, and the larger the cylinder the more parts you should divide the surface into.

Divide the pitch into the same number of parts as you have made on the circumference of cylinder; lay off one part of the pitch on the first line, two parts on the second line, and so on around the cylinder, counting the joint on each as a line, until on the last line you lay off the full pitch. Now with the dividers set to the pitch and starting from these points, which, by the way, are to be laid off from the line made around pattern in the lathe, you space off each line the whole length of drum. In laying off the first turn of spiral, you should make it right or left handed as may be wanted.

Now you need a templet to draw the lines between these points already found, and which are intended to locate the line of spiral. Make your templet in this way: fit a piece of hard wood to the surface of the pattern five or six inches long and one-half inch wider than the spaces between parallel lines. Straighten off one edge to one of the lines; make a gauge line on the side next cylinder at a distance from the straight edge equal to one of the spaces between parallel lines on cylinder. Square across one end of the piece for templet. Then measure on the gauge line from the squared line a distance equal to one of the parts into which the pitch was divided. A spiral line drawn from this point to the point where the squared line intersects the edge of templet will show where to cut templet.

This spiral line may be drawn in the manner illustrated by me in AMERICAN MACHINIST, April 17th, 1886, page 4.

With this templet you may lay off the line of thread or groove the whole length of drum.

For the core print, which needn't be over $\frac{1}{4}$" thick, get out some pieces like staves of the same thickness of print and about two inches wide. Make a box to cut them into lengths, sawing them on a line as near the pitch as you can. Fit each piece to the line of groove on cylinder, and gauge them to the correct width, or you may make a box that will cut them to the width and bevel them so that they will draw out of the sand all at one operation. Make it of hard wood, like Fig. 30. Make the space left for the prints so that one of the pieces will slip in easily, then put it in your bench vise; this holds all firm to work off print. You must be sure to give print bevel enough to draw. Test this by holding a piece on the drum and trying it with your square.

After you have fastened all the prints on, the next thing in order is the core-box. This should be made as long as will be convenient to handle and still be an equal part of one-half the pattern. The box will have a section like Fig. 31, and is made of four pieces and parted on a line perpendicular to axis of pattern. Get out the pieces wide enough in the direction of length of pattern to cut off to the pitch after they are squared up.

If the groove is to be stopped square off before reaching the end of pattern, it will only be necessary to cut off the core to length needed; but if the groove or thread is run out at the end like the thread on a bolt you will have to make one or perhaps two pieces to lay in box as shown by dotted line *a*, in Fig. 32, to make the core fit the end of pattern. This piece is also shown at *a*, in Fig. 31. The great difficulty in making patterns having a thread or spiral groove is in laying them out; you must divide the circumference of patterns accurately, and also the pitch, both into the same number of parts, and you must also be very particular in laying off the parts of pitch which locate the first turn of spiral on the surface of pattern.

The spiral on this drum we have made need not be perfectly true, still it will look much better if you make it as accurate as possible, and if you exercise due care in laying it out you will better pleased with the result.

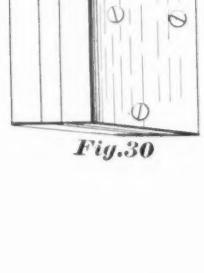


Fig.30

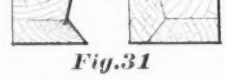


Fig.31

Fig.32

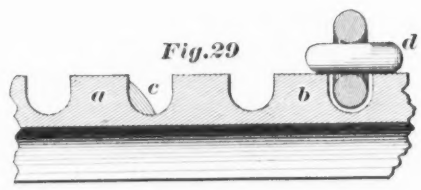


Fig.29

PATTERNS FOR SCREWS.

Indian Castings.

During the spring meeting of the British Iron and Steel Institute, says the *Ironmonger*, C. Burdon Clarke read a paper of certain descriptions of Indian castings. He says: "In preparing the mould, impressions of the various parts of the pattern are taken in clay, and these pieces, when nearly dry, are, after trimming, stuck neatly together, and kept in place by several layers of mud, in which some fiber is mixed. The mould, when ready, has but one vent, which, placed on the most convenient side, is carried up into a sort of bottle-neck.

If the object is small, several moulds are attached together, and the vents united by a single short neck of clay, to which a crucible, enclosed in an egg-shaped ball of clay, is attached. The size of this crucible depends upon the exact amount of metal required to fill the mould or moulds; and this quantity being known by experience, the founder places it inside before closing up. No provision is made for the escape of air from the mould when the metal is poured in. The mould and crucible (now in one piece) is allowed to dry, and after several coats of clay, tempered with fiber, have also been well baked on by the sun, the furnace is prepared.

This is simply a circular chamber about 2 feet 6 inches in diameter, 2 feet in height, with a perforated hearth and no chimney. Half-filled with charcoal, a good heat is obtained by the use of several sheepskin bellows from beneath. When ready, as many moulds as the furnace will hold are placed in it, the crucible end of each being imbedded in the fire. A cover is placed over, and the fire kept up until, upon examination, the moulds are found to be red hot. They are then taken, one at a time, and replaced in a reverse position, the crucibles being now above. The metal flows down into a red-hot mould, and penetrates the finest portions of the surface without suffering from air or chilling. The fire is allowed to gradually cool, and when the objects are broken out of their clay covering, the metal is soft and malleable.

A method of casting (by the use of a wax pattern, which is destroyed in the moulding) is well known, but in one particular case the process has been carried further than would be at first believed, and of this I will now attempt a description.

The object produced is an anklet, a flexible ring about 4 inches in diameter, made from an endless curb chain. Such curb chain trinkets are common in India, and are generally made from thick silver-wire rings interlinked and soldered one by one. In this example, the anklet is of bronze, and consists of a complicated chain of forty-three detached links, the whole being cast by a single operation. The first part of the process is the preparation of a pattern in wax, a delicate work, each link having to pass through four others, and to bear three small knobs or rosettes. These are, in two instances, but ornaments; the third, however, serves as a channel for the metal to enter each ring. Then commences the most difficult part of the work, each ring having to be slightly separated, and this is effected by painting in a thin coat of fine clay until there is sufficient to form a partition. Other coats of clay are added, until a thickness of about half an inch is attained, when a groove is cut round the upper side of the ring, and deepened until the row of knobs is bared. The wax is then melted out and the mould attached to a crucible, as before described. When cast, and the mould broken away, the chain comes out inflexible, being attached to a rod which runs round where the groove was cut. This is broken off, and the chain is complete.

LETTERS FROM PRACTICAL MEN.

Skilled Machinists Needed as Much as Ever—A Log Chain Coupling.

Editor American Machinist:

I wish to take exception to a remark made by a recent writer in your paper. He says: "Now, as the different shops are working into specialties, it is getting so that a machinist can only do one thing, such as running a lathe or planer. A good chipper and filer is almost out of the question." Lathes and planers run themselves, but it takes just as much real skill to turn off good work on either as it ever did; and just as much, too, though, of course, of a different kind, as it does to chip and file. Among floor and vise hands the proportion of good workmen is just as great, if not greater, than it ever was before. Shops that have this class of work to do have good men to do it if they want them. I lately saw a key-seat in a 10" shaft that was extended by an apprentice with a cold chisel and file; the portion chipped was 8" long, $2\frac{1}{2}$" wide and $\frac{1}{16}$" deep. It required more than a mere glance to discover where machine work left off and hand work begun. I have seen lots of the hand work of the days of cast-iron engine shafts, but very little of it has ever excited my admiration. The most of it had what "Chordal" would call "the merit of uniform ugliness."

I read the AMERICAN MACHINIST every week, and can say that I owe more to that paper than to all the others I ever read.

The experiences that different men have in various ways are mines of useful information to me. I do not know as I could have got out of the engine scrape as easily as Harry Hart did, but I got more appreciation once for a smaller thing.

Word came to the shop once: "Send up a man with lots of cold chisels and some gumption; coupling twisted off." I was sent. I found a 4" shaft with the coupling turning round on the end of it. Some time, about six inches had been welded on to the end of the shaft, and the job was not solid. This part had twisted off, partly, I suppose, because the weld was not sound and partly because the key was only about five inches long.

With some impatience the proprietor inquired why that break could not have held off two weeks longer, and how long it would be before he could be running again. I looked at the break and found about three inches of the shaft in the coupling beside the broken end, and told him in thirty minutes. To be sure, he did not believe it. I asked him for a piece of strong chain. A piece of $\frac{3}{4}$" cable, about 15 feet long, was brought to me. I tied one end of the chain with a piece of marline to the driving shaft, then wound the chain around the shaft toward the coupling in a direction opposite to that which the shaft turned. Near the middle of the chain I came to the coupling, around which I took a turn and passed on to the driven shaft, where I used up the rest of the chain and tied the last end with some more marline. The engine was started, and the chain grunted a little while the first turn was taking up the slack; then the whole thing moved along as of old. Time, fifteen minutes.

The proprietor handed me as his thanks a $10 greenback, and many times since that has sent to the shop for "that log-chain machinist."

F. L. JOHNSON.

Waukesha, Wis.

The Air Brake Question.

Editor American Machinist:

I would like to make a few suggestions to T. Paxton, of the A., T., S. & F. R. R., in regard to his air pump question, as stated in the AMERICAN MACHINIST of May 29.

The steam end of your pump is all right, the trouble is with your air valves. Your receiving valves should have wear $\frac{1}{8}$ instead of $\frac{1}{16}$, your discharge valve wear $\frac{1}{16}$ instead of $\frac{1}{32}$, make sure that all air valves open and close at the proper time, and your pump will not pound.

The sticking of a valve for an instant, or unequal lifts of discharge valves will cause a pound.

A little experimenting with different lifts will determine where the trouble is. Keep a record of the lift of different valves for future reference.

L. D.

Heavy Boiler Pressures.

Editor American Machinist:

Can it be possible that Mr. W. H. Hoffman does not read the AMERICAN MACHINIST?

What leads to this inquiry is his article on compound engines in your current issue, in which, on the question of high steam pressures, he says "we have no material at hand that will safely stand over 200 lbs.," whereas

it is a well-known fact that several boilers of large capacity are in daily use, carrying a working pressure of 250 lbs. by gauge.

It is not the material that is at fault, but rather the method in which it is put together that limits the pressure of steam, and it is quite evident, as Mr. Hoffman intimates, that the dangerous thick shell of large diameter will of necessity be disposed of in designing boilers of moderate first cost that will safely carry very high steam pressures.

In the light of what has already been accomplished, may we not safely conclude that, if a demand for boilers to safely carry "high-pressure steam" is presented, the ingenuity fo the makers of modern boilers will be equal to the occasion. W. H. ODELL.

Yonkers, N. Y.

A Wire Chuck.

Editor American Machinist:

I enclose in this a tracing of an improvement of mine in wire chucks that you can give the craft the benefit of if you see fit. A serious defect in the usual style of wire chucks is in the sticking of the taper bushings when the nut is loosened, requiring at times several blows to free the same in order to loosen the wire. This objection is entirely overcome in the device here presented, and its merits have been proven by practical use.

Fig. 1 is a longitudinal section of this wire chuck,-with all its parts in place. The improvement consists of the peculiar construction of the taper bushing and the nut *d*. This bushing is made to protrude from its taper bearing, which extension is turned down and threaded. The nut *d* is internally threaded in the outer end to correspond. The thread on the bushing is of finer pitch than the thread on the main holder *e*, and consequently, when the nut *d* is screwed up, it advances faster along the holder than along the bushing, and the differential movement carries the bushing into the taper hole in the holder *e*, contracting the bushing and gripping the wire in the usual manner. The power of the chuck can be increased at the option of the maker by making the pitches of the two threads nearer the same. In loosening the chuck, the bushing is drawn out of the taper by the same differential movement.

Fig. 2 is an end view of one of the bushings, showing longitudinal grooves made to allow easy expansion and contraction.

O. S. WALKER.

Exhaust Pipe for Extension Front Engines.

Editor American Machinist:

I notice in the AMERICAN MACHINIST a design for exhaust pipe for extension front engines by Mr. J. N. Lauder, Superintendent Rolling Stock, Old Colony Railroad. I send you herewith a blue print of one of nearly the same design, that I put in use on the Chesapeake and Ohio Railroad when I was connected with that line as master mechanic of Huntington division, nearly three years ago, on a lot of 16″x24″ and 17″x24″ McQueen passenger and freight engines. I received extraordinarily good results from this style of exhaust pipe, using a $4\frac{3}{4}$″ nozzle in the 17″x24″ passenger engines. They steamed freely and no fire was thrown from stack when engine was working hard. I found that by using a bell-mouthed stack saddle, as shown, better steaming results can be obtained, gases being allowed to escape more freely than by using a saddle where the barrel of stack extends through saddle and enters smoke arch at top.

To obviate the difficulty Mr. Lauder speaks of in engines that have the exhaust pipes connected (as is the present custom) in center of cylinder saddle, I fastened a V-shaped piece of sheet iron about 15 inches high to back of exhaust pipes, which prevented sparks from lodging back of them. This arrangement improved the draft very materially. W. H. THOMAS,

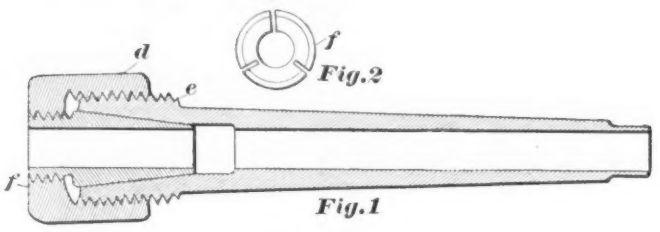
Supt. Motive Power E. T. Va. & Ga. R. R.

Knoxville, Tenn.

That Air Trap.

Editor American Machinist:

In answer to the inquiry as to the philosophy of the air trap in water pipe, I suppose he following to be the explanation:



WIRE CHUCK.

Let the annexed diagram represent the conditions—*A* being a cistern and *B* the outlet cock for drawing water, the pipe *C* being free throughout its entire length.

When the cistern is first filled I believe the water can be drawn as expected, but when first drawn down water will be left standing in the vertical pipe up to point *a*.

When the water is again let into the cistern the air in the pipe above *a* cannot escape, and is compressed by the pressure of water in the cistern, and this will force down the column of water in the vertical towards *b* forcing, out some of the water in pipe *C*.

This by the accumulation of water in the cistern may go on until the pipe *d* is filled and a portion of the stand pipe at *e* is filled, but if the head of water in the cistern and in the upper end of stand pipe at *e* does not exceed the difference in the head of water between that at *b* and *c*, then the system is air trapped.

If the pipe *d* was sufficiently long a full cistern might not give head enough to force out the water in the stand-pipe *C*.

This explanation may not be the full one, as possibly another and a more mysterious factor may enter into the problem.

It is a well-known fact that a comparatively slight impediment at the muzzle of a gun will cause it to burst when fired.

The why has not, as I am aware of, been proven, but it is usually assumed that the suddenness with which the air between the bullet and impediment is compressed, has much to do with it, though that may not be true.

In case of a troublesome air trap the remedy is a pet cock in the lowest part of the pipe. JOHN E. SWEET.

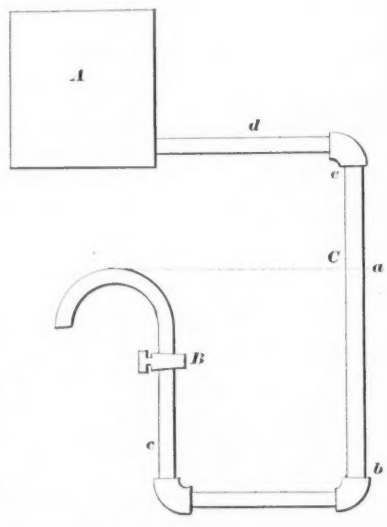
EXHAUST PIPE FOR EXTENSION FRONT ENGINES.

An Air Pump Difficulty.

Editor American Machinist:

The "Question About Air Brakes," by Mr. Paxton, in your issue of May 29th, brings to mind an experience of mine which is in some respects similar, and may throw some light on his trouble.

An air pump I had overhauled thoroughly, having put in new piston rings, main valve rings and bushes, reversing valve and bush, and reversing piston in the steam end, and putting in new valves and thoroughly grinding them in on the air end, as well as testing to find any leaks through the copper head packings on both steam and air ends, persisted in going very badly, making the down stroke in three seconds, but requiring ten to twelve seconds for the up stroke. The pump worked very smoothly however, and



AIR PUMP DIAGRAM.

would have been as good as any except for this and a peculiar wheezing of its exhaust; the latter trouble is what directed me to the true difficulty. I noticed that the exhaust taking place during the up stroke was a positive blow, while that on the down stroke was as clear as I ever heard a Westinghouse pump make. This led me to examine the main valve, which I found was driven so low by the reversing piston as to open the lower exhaust ports as well as the upper exhaust and the lower steam ports; putting in a longer pin for the main valve to drop on cured that difficulty, the pump running with practically uniform strokes; but it introduced another, totally unlooked for; the pump at the beginning of each up stroke would pound as if striking a blow with a heavy hammer. Taking an old reversing piston I experimented by filing off the end of stem until having shortened it to $2\frac{1}{16}$″ in length, measured from the lower side of head, I found the pump to work smoothly; this length permitted the reversing piston to strike the bottom of its cylinder (where the makers have arranged for its cushion) before the main valve reached the stop pin.

Putting in a new reversing piston of the same length stem made this pump all right for the road. My experience leads me to think that a lift of about double the amounts mentioned by Mr. Paxton is good practice. I have tried the same lift and find, as reasons for the larger lifts, that the pump will run faster and freer when getting up pressure owing to the more ready escape of air through the valves. When using the small lift I have had the discharge valve chambers get so hot from friction of the air through them as to make them hardly endurable to the touch, and think this heating causes the burning on, and consequent clogging, so common to air valves when a poor oil is used.

CHAS. S. BEACH.

Bennington, Vermont.

The Feed-Water Question.

Editor American Machinist:

I am disposed to sympathize with the bottom dog in the fight, and just now it would seem as if the parties who are claiming to heat water by exhaust steam at atmospheric pressure higher than 212° are getting the most punishment. Let me present an argument in their favor; I do this because it seems to me that they have been unfairly treated; that is, they have been silenced without argument.

Of course it is all contrary to the laws we were brought up on, but would it not be better if some one kindly pointed out their errors as an invitation to some one to furnish the demonstration. I array myself on the other side.

Cottrell says that the adiabatic curve falls below the saturation curve, and Rankine says: "If no heat be given to steam from the outside while expanding, the curve of expansion will fall below the curve of saturation." That is, that some of the steam will condense in expanding, for to fall below the saturation curve some of the steam must condense. To contradict such authority requires some hardihood, yet this is not the fact.

Suppose an engine cutting off early. At the time of cut-off there is saturated steam in the cylinder, together with some water from condensation; as expansion goes on, this water is re-evaporated, and at the end of the stroke we have a cylinder full of saturated steam. Re-evaporation is an undisputed fact; it is the only way we can account for the high expansion curve on some indicator cards, and in a toy glass engine one can see this fact beautifully illustrated.

We started with saturated steam and water, and after expansion, had saturated steam alone.

If we had had only saturated steam at the beginning of expansion what would we have had at the end?

For clearness let us tabulate it:

Before Expansion.	After Expansion.
Saturated Steam and Water.	Saturated Steam.
Saturated Steam.	?

There can be but one answer, superheated steam. In this conclusion the influence of the walls of the cylinder has been omitted. Let us apply the tables; they are found principally on Reynault's experiments; are slightly different in different works, but are substantially the same.

Let us suppose we are expanding from 80 lbs. to 20 lbs. absolute pressure.

Units of heat from 32° in one pound of steam at 80 lbs. pressure.....	= 1177
Units of heat from 32° in one pound at 20 lbs. pressure.....	= 1151
Difference	26

Where do these 26 units of heat go to if not to superheat the steam? and, instead of a temperature of 228°, due to saturated steam, we would have something higher. I will not attempt to calculate it, for I would strike too many conflicting formulæ.

The specific heat of water varies below the boiling point, and I have no means of knowing how it behaves in steam, but I would guess from an inspection of various tables that, taking the extra expansion into account, we would have a temperature of about 235°. Now to the case most favorable to heating feed-water above 212° without live steam jacket or back pressure.

Our engine has short passages, Corliss valves, takes dry steam at absolute pressure of 80 lbs., takes steam full stroke, and barks like a dog. We have eliminated the principal causes of cylinder condensation, and steam leaves at atmospheric pressure carrying a surplus of 31 units of heat per lb. of weight above saturation, or is superheated 31 units per lb. of weight, and the temperature is, say 222°.

To keep up the level in the boiler, each pound of steam is required to heat one pound of water; suppose the feed water is at 60°, it requires 152 units of heat to raise it to 212°; but exhaust steam under the conditions we have considered has 997 units of heat more than water at 212°, so it can be seen there is considerable to spare. In fact, I fail to see if the conducting surfaces are ample enough and so arranged that the currents of exhaust steam and ingoing water are in reverse direction why one pound exhaust steam at a temperature of 222° will not heat one pound of water to a temperature of say 220°.

JOHN COFFIN.

Pen Attachment for the Conic Compass.

Editor American Machinist:

The chief objection to the "conic compass," as it is illustrated in the AMERICAN MACHINIST for May 22d, is that the line of the pencil rod $Q\ P$ is generally so oblique to the paper that an inking pen cannot possibly be used. For the same reason, if a pencil be used, it marks with its side more than with its point, and the line is poorly defined.

The compass may be made practical and useful for ordinary drafting purposes by the device here described, which is simply a contrivance for so holding a pen or pencil that it shall always be at right angles with the paper.

The pen a swings upon a head c, that is fastened to the end of the pencil rod S, and is kept at right angles with the paper by the weighted outrigger f, which will also keep the rod S from turning in its sleeve R. The parts are so made that the pencil rod, the line of the trunnion d, and the line of the pen, shall all meet in the single point P; and the line $P\ X$ of the pen must also be at the right angles with the paper, as well as in a vertical plane through the line $Q\ P$.

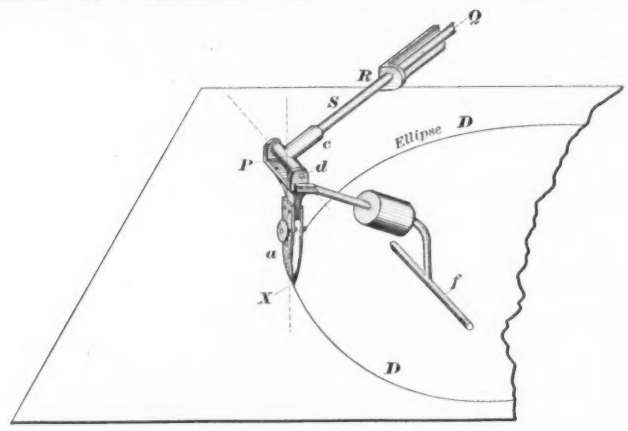
It is possible, by another attachment, to to keep the pen always tangent to the curve it is drawing, but unless the conic is very flat this further complication is not necessary for the pen, and would never be of use with the pencil. GEORGE B. GRANT.

Boston.

The effect of lead on the slide valve is often miscomprehended from lack of clear understanding of the relative motion of the piston and valve at the time when lead takes effect. Near the end of the stroke the valve is traveling faster than the piston; and in an ordinary slide-valve engine, in which the valve has, say, two inches or more travel, the distance the piston will travel while the valve is being opened $\frac{3}{16}$ inch is insignificant in every respect. Such a valve may be given $\frac{3}{16}$ inch, or more, lead if it will run smoother for it without fear of loss.

In reference to large lead, it will not always—probably not generally—make an engine run smoother, but it will sometimes do so.

Another bugbear with those who have not



PEN ATTACHMENT FOR CONIC COMPASS.

gone over the subject is a belief in loss from early exhaust opening of a slide valve. In a slide valve with constant travel it is very seldom that absolute loss results from too early exhaust opening. Just as in the case of lead the exhaust edge may open the port a good deal while the piston is traveling through that part of its stroke (that is near its termination), when pressure results simply in increasing friction. But with a slide valve it is sometimes advisable to have inside lap for the sake of bringing about more compression and quieter running. Doing this will frequently result in some loss from not getting the exhaust open early enough, but it may not be so bad as heavy pounding.

American Locomotives in England.

A correspondent of *Engineering* (London) states that "in ordering English locomotives, colonial engineers require specifications, followed by careful inspection and examination, of all engines supplied from England, while the same engineers will buy engines from America without specification or inspection."

The same correspondent also adds: "Why is it that every English railway must have a class of its own and these often designed by ignoramuses for cranks; consequence is English locomotive builders cannot build engines to stock. American builders, on the other hand, work on stock and especially in slack times; and being able to order the materials they require without consulting any one, they can keep their men and tools more constantly employed and work cheaper and better."

In concluding his letter, this writer says: "Of the 12,000 engines on English railways at £400 each, £4,800,000 would have been saved on their original cost, had they been made in America.

Taking the annual mileage of each engine at 25,000 miles, and the life of an engine 500,000 miles, thus, to keep up the stock, the English railways require to build 620 new engines a year. Were they to get them built in America, they would save £248,000 a year, a consideration certainly in these dull times."

The question may well be raised why locomotive shops are almost invariably fitted with boilers of the locomotive type, generally set where there is a first rate circulation of air around them.

The loss of heat is fully shown by the possibility of heating the shop by such heat, which has been successfully done; and why railroad shop boilers are not usually set in brick is another question that is not as easily answered.

The New York Central shops, at West Albany, have boilers set in brick.

The Schenectady Locomotive Works use boilers jacketed with cold air, but will undoubtedly brick in their boilers when some contemplated changes are made.

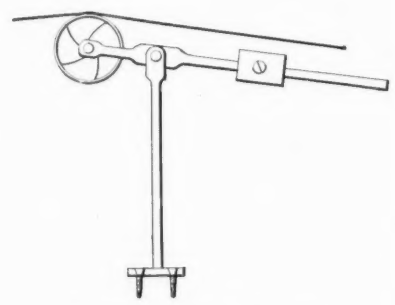
Uncovered steam pipes, when exposed to cold air, are expensive possessions, but uncovered boilers have no excuse at the present state of steam engineering.

Quarrying Italian Marble on the American Plan.

We lately received from the owner of extensive quarries in Italy a request to advise him if there was any machinery built in this country capable of quarrying out large blocks of marble from the rock. Fortunately our files were equal to the occasion. In July 1879 we illustrated a machine of the kind referred to, one capable of doing the work of 50 men, and therefore fully deserving the title labor-saving. Steps have been taken to meet the wishes of our Italian correspondent, and we doubt not the near future will see his marble duly quarried on the most approved American plan.

Governor Belt Tightener.

This handy rig, as shown by the engraving, is intended to prevent slipping of an engine governor belt. But little description is needed. The weight is a hollow iron shell, filled with lead to give weight; this weight may be moved toward end of the arm until the desired strain is brought to bear on the belt.



GOVERNOR BELT TIGHTENER

This device is shown as made by Thomas Strickland, and is applied to the Corliss engine which operates the North Hudson Co. Cable Railroad. The device is not patented.

A Job in a Government Railroad Shop.

Twenty odd years ago, when the Government was somewhat extensively engaged in railroading in some of the Southern States, the writer was employed at Nashville, Tenn. The normal condition of things there was, a good many men, good wages, and few tools to work with. The time required to do a job of work—at least, outside the few machine tools, which were run, after a fashion, night and day—was one of the things left out of consideration.

The men, outside the machine shop proper, were divided into gangs of six to ten. If a gang could get a small bench in one of the sheds and one vise, they were considered very well provided for; two vises constituted a positive luxury.

Files were plenty enough, but it required considerable skirmishing to get chisels, and more to keep them, as right in any kind of property was not very clearly appreciated.

Our gang was fortunate enough one day to strike a good job, that is, good because there was some prospect of its lasting; loafing got to be irksome. The job was putting in shape the four guide bars—not case-hardened—of a locomotive. They were badly worn and cut out of all resemblance of truth, and of course ought to have gone to the planer; but this wasn't to be thought of.

Such a thing as a straight edge—other than some standard scales, none over 12 inches long—was not known in our part of the works. We held a council of war and determined that the only way to satisfactorily do the job was to put in practice what we knew about making surface plates; in other words, to make three surface plates of three of the guides; of course either of them would answer to true up the fourth one by.

We did the job in this way, finishing with scrapers, as if making a steam-tight job. All the time we had to contrive means to keep the surfaces we were fitting true with the spots for attaching to lugs on cylinder heads and yokes.

It is doubtful if guides were ever better fitted, and equally doubtful if the truing up of four guides ever—before or since—cost so much. It beat Navy Yard practice a long way.

The cotton seed crushers of the United States recently held their ninth annual convention. In mentioning the proceedings the *Oil Paint and Drug Reporter* says:

"One great proof of the value of an association of gentlemen connected with one interest, was the question brought up on the first day's session concerning the act before Congress to impose a tax upon manufactured butter, as they were able, jointly, to transmit a telegram to the various representatives in Congress from the cotton States requesting their influence to defeat the bill."

The article known as "Manufactured Butter" is made of cotton seed oil, oleomargarine and other fats and greases. The product is sold at retail as butter, and consumers are deceived. If a tax on the oil would prevent the deception the bill ought to pass. If not some other law ought to be enacted that will prevent it. One of the evils of the times is the imitation and adulteration of food products.

The "Hydra-Headed Rail" is the name of a late Australian invention, which consists of two Z-shaped pieces, forming built-up railroad iron. The two pieces are similar in shape, and each of the four flat surfaces can be exposed in turn to wear of the car-wheels. These rails "break joints," and the pounding of rail ends upon chairs or fish plates is said to be dispensed with.

Mr. P. M. McLaren, who has for four years had the local management of the sales of the Babcock & Wilcox boiler from the main office 30 Cortlandt st., New York, has been appointed general eastern manager of sales, retaining the old office at 65 Oliver st., Boston. Mr. McLaren is well known among the New England manufacturers.

In telling about electric lighting, an English journal says, "Noah made the first 'ark'-light."

The Master Car Builders' Association meets at Niagara Falls June 8th, and the Master Mechanics' Association meets in Boston June 15th.

The experiment is being tried in an English gas works of burning the tar products, in place of coke, in the manufacture of gas. It is expected that the method will lessen the fuel expenditure about $720 per year.

There is one thing manufacturers cannot consistently or reasonably do. They cannot condemn boycotting in its grosser forms, because practised by working men, while themselves practising it even if in the more refined, but more damaging, forms, against working men.

If those who draw comparisons between the economy of the locomotive and stationary engine unfavorable to the former will imagine the boiler of a stationary engine with a run of about twelve feet between the furnace and chimney, and the combustion of 125 to 150 lbs. of coal per hour for each square foot of grate surface, they may find reason for modifying their opinions.

A Manufacturer's Plan for Shortening the Working Day.

We have received from Edwin Norton, of Norton Bros., manufacturers of sheet metal goods and special machinery, 40 to 46 River st., Chicago, a memorandum which, we are informed, is to be widely distributed among manufacturers, and of which a copy appears below. It embodies details of a proposed plan, original with Mr. Norton, for settling the pending, and, as he hopes, preventing many future labor troubles. As a successful manufacturer employing nearly 400 workmen, Mr. Norton speaks to manufacturers as one of themselves, and his proposition is likely to command attention. Mr. Norton will be recognized by our readers as the inventor and manufacturer of important labor-saving machinery, which has been illustrated in our columns, and which has exerted great influence upon the branch of manufacture to which it relates.

The circular is as follows:

To American Manufacturers.

Believing that a permanent settlement of the existing disturbed condition of business in our country can only be reached by a reasonable understanding between employers and employes, and that a gradual reduction of the present hours of labor under proper protection and restrictions will not be detrimental to the best interests of all;

And that during the gradual scaling down of the working hours, which would mean a virtual increase of pay, our workmen should be protected by the united action of their employers from an influx of labor from foreign lands, also that a premium should be placed upon American citizenship, in our workshops as well as in places of trust;

And also that a basis should be found for ultimately reducing the working day to eight hours without disturbance to our manufacturers, and one which will meet with the co-operation of all labor organizations, and in the belief that this course of action will meet the approval of those who have the best interests of all our people at heart. Therefore, this Union is formed for the perfecting and carrying out of the above purposes in the following manner:

SEC. 1. This organization shall be known as "The American Manufacturers' Union," and all manufacturers of any article throughout the United States shall be eligible to membership by signing the Constitution and such By-laws as may be adopted.

SEC. 2. The purposes of this organization shall be, 1st. United action on the part of manufacturers throughout the United States, looking to a gradual and fixed reduction of the present hours of labor, until eight hours for a working day (which is now the legal standard of the United States and of several States), has become the recognized rule throughout the country; 2nd, For the better protection of our workmen from the competition of foreigners anxious to reap the benefit of their improved condition, an agreement, upon the part of employers, to give the preference, during this period of change, to workmen resident in this country at the time this agreement shall have taken effect, over foreigners who come to the country after that date, or who are unwilling to become citizens.

SEC. 3. This organization shall adopt the plan herein set forth, say, on the first day of January, A.D. 1887, and it shall remain in force for five years, or until the 31st day of December, A.D. 1891, and as much longer as a majority of its members shall desire.

SEC. 4. All members of this Union shall agree that during the year 1887, nine and one-half hours shall constitute a day's work; and that during the year 1888, nine hours shall constitute a day's work; and that during the year 1889, eight and one-half hours shall constitute a day's work; and that during and after the year 1890, the present United States standard of eight hours shall be recognized by all members of this Union throughout the country as a legal day's work.

SEC. 5. Members of this Union shall exact from all persons in their employment an agreement to accept the conditions herein set forth, during the above period of time, and it shall be understood that no corresponding reduction of present wages shall be made on account of the reduced hours of work.

SEC. 6. This action shall not affect farm laborers, but relates to mechanics and skilled laborers of every kind.

In common with many other thoughtful men, including not a few manufacturers, Mr. Norton has long believed that the growing encroachments of labor-saving machinery must eventually lead to a reduction of the working day in the manufacturing trades, the chief points upon which individuals holding such views have differed being as to when the change should be inaugurated, how it should be brought about, and how far it should extend when attempted. Many abortive and some temporarily successful attempts have been made but these have not been general or systematic, and have frequently been attended with disastrous results, because attempted without concert of action among establishments willing to make such a change, and because no way of mitigating the shock of transition was provided.

Mr. Norton believes that the time has come when such a movement should be generally attempted, and proposes a plan which seeks to correct both these defects. The plan aims to secure the desired result by forming a voluntary association of manufacturers for the express purpose of making the change by a system of gradation extending through four, or more properly speaking, three years, giving manufacturers opportunity to adjust their business each year to a basis well understood in advance, and not radically different from that of the preceding year.

Whatever may be thought, either of his proposition to discourage immigration during the proposed period of change, or of the manner in which he proposes to attempt it, viz., by the voluntary and concerted action of manufacturers, the suggestion will be recognized as an interesting one.

In laying this plan for shortening the hours of labor before manufacturers and machinery establishments we cannot do better than quote from several letters, received by us from Mr. Norton in explanation of it. Under date of Chicago ,May 8, 1886, he writes:

I am very much interested in the solution of the question of eight hours for a day's work, but do not favor the means now being used in our city and elsewhere to carry out this end. I do not, of course refer to the "dynamite fiends," for no sensible man connects them in any way with the movement, except as birds of prey.

But the labor organizations who are in real earnest, and willing to endure strikes with loss of pay, etc., which always follow, are now engaged in what may be called a revolution (for it amounts to nothing less) in order to bring about the reduction in the hours of labor which has been planned for years. In this city their fortunes are varying; in some instances they succeed in forcing their employers to a compromise, which in itself can but be a makeshift to bridge over a pressing contract, or to give the employer time to collect his thoughts and lay his plans to "get even" with his men. It requires but little knowledge of human nature to see that when "a committee of employes" call upon the head of an establishment to "arbitrate" the eight hour question, and settle on some basis for the entire shop, he sees that "behind them stalks the headsman," Strike. Unless he is conciliatory in tone and yielding in manner, no matter under what conditions his establishment may be running, the apparition that accompanies the committee may soon materialize into a stern reality. He therefore feels that for the present "we must dissemble," and very likely he makes concessions which he knows cannot be of a lasting character, and will only lead to further trouble.

Now I am of those who believe that machinery has so greatly increased the natural output of our manufactories, and is so constantly being improved, that without doubt the hours of labor may gradually be lessened without diminution of wages, thus enabling the employes to receive a share of the benefits arising from the extended use of labor-saving machinery, for which America now enjoys a world-wide fame.

Nor do I favor the idea that a lessened number of hours of labor would make "drunkards" of our workingmen, and that the "saloons" would get all the benefit of the shorter day's work. In my opinion those who give utterance to such sentiments are at heart selfish, and begrudge the workingmen anything but the bare necessities of life. I have some faith yet in the workmen with whom I have been intimately connected for nearly twenty years, and have always found them willing to act fairly, and on the side of right and justice.

* * * * *

In relation to this subject, let me say that in our own business we have this year adopted the plan of "profit sharing" with all our employes. We propose, in addition to regular wages, to divide among all those who have worked with us six months during the year a certain proportion of our profits in the ratio of their regular earnings as wages, the total amount so divided being guaranteed not less than $10,000, and without detriment to wages. We have no present expectation that our firm will lose any money as a result of this step. I will add that no strikes have occurred in either our Chicago or our Maywood shops.

* * * * *

I am of the opinion that the manufacturers of the United States now have it in their power to begin a movement which in a few years will, without loss to themselves and without disorganizing their business, greatly improve the condition of every skilled laborer and mechanic employed in this country, and that this may be done by the organization of a national "American Manufacturers' Union," founded upon principles similar to those set forth in the memorandum enclosed. These are quite simple, and suggest the adoption of the eight-hour day in three years' time, beginning January 1st, 1887—the intervening time to be devoted to organization. A half-hour reduction per day yearly, brought about in this way, will not disorganize business.

In the combination of a gradual reduction of the hours of labor without decrease of pay, with the more settled condition of business during a term of years, attended with a greater security for capital seeking investment in new enterprises, which, as I am persuaded, would naturally result from liberal action of this kind on the part of manufacturers, may be discerned the promise of better days for both employers and employed. So far as this plan has been laid before practical manufacturers it has met with general approval.

If for any reason unknown to me at the present time this plan is impracticable, then I believe some other must be sought, which will include the amicable co-operation of both manufacturers and workmen in order that a lasting settlement may be made of this matter, which, like Banquo's ghost, refuses to "down."

During the past few years labor has organized into a powerful force under skilled leaders, and laborers are daily being taught the value of organization and obedience to discipline and rule. Organization of labor must be met with organization of employers, and while in my opinion no general union of all trades can be formed that would be lasting if it undertook too much, a simple platform should be formulated upon which all who hold similar views may unite to carry out a few general principles which would benefit all alike.

* * * * *

Our working folks have had an idea for more than twenty years that a proper division of the twenty-four hours is in thirds, eight hours for sleep, eight hours for rest and recreation, and eight hours for work. As long ago as 1867 they organized and set the first day of May, 1867, for the time to inaugurate the new day. After the usual number of strikes and lockouts they found that they had not enough organized strength to enforce their demands, and they have been steadily at work ever since, organizing and perfecting their plans to enforce this idea. Cunning politicians saw the hand writing on the wall, and through their influence the United States Government adopted eight hours as a legal day's work. This has helped the movement undoubtedly, as it gives their cause an apparent justice that otherwise it would not have.

To the suggestion to make a less number of hours the standard, say nine, the answer is that it would not be worth while. Labor seems determined to try the eight-hour plan, and I think the true policy is to meet them fairly and test the question.

To the inquiry "Would it not cut off export trade?" I say I believe not, to any serious extent. I am confident American invention and ingenuity can easily wipe out such a difference caused in such a gradual way. It may also be asked, what the Old World is going to be doing all this time? Standing still? No, indeed. Shorter hours must prevail there as well, if adopted here. The costly plant of machinery, which is the bugbear of some, can be run, when necessary, for one, two, or three hours' overtime, during busy seasons, and if there is not a demand for goods to warrant, then over-production would be saved by letting it stand idle for two hours per day.

I admit that living expenses would advance, but the purchasing power of money is very many per cent. greater now than ever before, and consumers are getting the benefit of it. Workingmen say they are willing to forego some of the luxuries for the sake of more time with their families and the opportunity to live farther away from their work in homes instead of tenements.

I do not think this or any plan should be attempted unless, after fair discussion, manufacturers throughout the country would generally adopt it.

It will be seen that there is no element of ambiguity about either Mr. Norton's proposition or his manner of recommending it to public attention. We shall await with much interest the verdict of the manufacturers and mechanics of the country, and shall be especially pleased to invite expressions of opinion from machinery establishments regarding it.

Chicago Meeting of the American Society of Mechanical Engineers.

The spring meeting of the American Society of Mechanical Engineers at Chicago last week was well attended, from 150 to 200 members being present, and much interest was manifested in the proceedings at the different sessions from Tuesday until Friday. It was greatly regretted by all that President Coleman Sellers was sick and unable to be present. He sent a letter expressing regret for his unavoidable absence, and deep interest in the society. A telegram was sent to Mr. Sellers from the meeting in response to his letter. Mr. Henry R. Towne presided at the sessions. Some 92 members were elected, making about 700 members now in the society. Mr. Towne responded to a welcome address by Mr. Roche. The local committee of arrangements deserve great credit for their work. The committee was composed of Wm. F. Donovan, chairman; N. C. Bassett, C. C. Hill, J. A. Roche, M. C. Bullock, A. F. Nagle, Angus Sinclair, Hosea Webster, Chas. F. Elmes, G. E. Palmer, James N. Warrington.

A dinner was tendered to the visiting members and ladies by the local committee on Wednesday evening, which was a pleasant affair. On Thursday the society accepted the invitation to an excursion by C., B. and Q. Railroad, and visited the stock-yards and packing houses of Chicago and the North Chicago Rolling Mill, also the city of Pullman. Considerable pains were taken to make the members acquainted with each other. Further notes of papers and discussions will appear in our columns hereafter.

A Pair of Large Hoisting Drums.

We noticed recently at the shops of the M. C. Bullock Manufacturing Company, at Chicago, a pair of hoisting drums of noticeable size and construction, building for mining purposes on the Menominee River. The two drums are on one shaft, one hoisting at the same time the other is lowering. They are loose on the shaft, except when engaged by the friction, by which they are operated; hence either drum may be stopped while the engine is running.

The drums are strictly built up, being made chiefly of wrought iron and steel, strongly put together. They are of "fusee" form, the smaller diameter being 10 and the larger 14 feet. A pair 30″x60″ engines of the Corliss type are connected, one to each end of the shaft on which the drums are situated. With these drums it is intended to hoist from four to six tons of ore at a speed of 1,200 feet per minute. The depth of the mine is 1,300 feet.

Larger drums than these have sometimes been used by gearing from the engine, but we do not recall larger ones directly connected.

The engine is operated by compressed air. There is abundance of water on the river, so air is compressed there and carried a distance of three and one-half miles to the mines, through a 24-inch pipe.

Minneapolis Mechanics' Institute.

A Mechanics' Institute has been formed in Minneapolis, Minn., chiefly through efforts of our enterprising contemporary *Wood and Iron*.

Ten months since five men met in the office of the above-named journal and formed an association known as the "Mechanics' Club."

At the April 1st meeting 70 names were upon the roll. Articles of incorporation have since been filed, the club name changed to the "Mechanics' Institute," and the club's scope of action broadened to the operation of schools, libraries, and the engagement of lectures on mechanical subjects.

There is this to be said in favor of large water space in a boiler, beyond the question of safety: The more water there is the more heat will be stored up for use, so the steam pressure will not vary so much when the demand is not constant, or the firing not regular. In this respect the heat in the water acts similar to the balance wheel of a steam engine; it is, so to speak, a balance wheel between the heat imparted from the furnace and that withdrawn in the steam, and fluctuations in either will be modified in their effect in proportion to the body of water.

AMERICAN MACHINIST

PUBLISHED WEEKLY.

BY

American Machinist Publishing Co.

HORACE B. MILLER, Pres't.

JACKSON BAILEY, Vice-Pres't.

LYCURGUS B. MOORE, Treas. and Sec'y.

96 Fulton Street, New York.

JACKSON BAILEY, Editor. HORACE B. MILLER, Business Manager.

F. F. HEMENWAY, Mechanical Engineer.

The American News Company,

Publishers' Agents, New York.

The International News Company,

11 BOUVERIE STREET, Fleet Street, LONDON, ENG., will receive subscriptions for the AMERICAN MACHINIST, at 14/7 per annum, postage paid.

DEALERS SUPPLIED BY

The Albany News Company, Albany, N. Y.
The American News Company, New York, N. Y.
The Baltimore News Company, Baltimore, Md.
The Brooklyn News Company, Brooklyn, N. Y.
The Central News Company, Philadelphia, Pa.
The Cincinnati News Company, Cincinnati, Ohio.
The Cleveland News Company, Cleveland, Ohio.
The Colorado News Company, Denver, Colorado.
The Detroit News Company, Detroit, Mich.
The International News Company, New York, N. Y.
The Minnesota News Company, St. Paul, Minn.
The Montreal News Company, Montreal, Canada.
The National News Company, New York, N. Y.
The Newark News Company, Newark, N. J.
The New England News Company, Boston, Mass.
The New Orleans News Company, New Orleans, La.
The New York News Company, New York, N. Y.
The Northern News Company, Troy, N. Y.
The Omaha News Company, Omaha, Neb.
The Pittsburgh News Company, Pittsburgh, Pa.
The Rhode Island News Company, Providence, R. I.
The San Francisco News Co., San Francisco, Cal.
The South West News Company, Kansas City, Mo.
The St. Louis News Company, St. Louis, Mo.
The Toronto News Co., Toronto, Ontario, Canada.
The Toronto News Co., Clifton, Ontario, Canada.
The Union News Company, New York, N. Y.
The Washington News Company, Washington, D. C.
The Western News Company, Chicago, Ill.
The Williamsburgh News Co., Brooklyn, E. D., N. Y.

SUBSCRIPTION.

$2.50 a year in advance, postage prepaid in the United States and Canada.

$3.50 a year to Foreign Countries, postage prepaid.

ADVERTISING.

Transient, 35c. per line, each insertion.
"Business Specials," 50c. a line.

EDITORIAL ANNOUNCEMENTS.

☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draftsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, JUNE 12, 1886.

CONTENTS.

	PAGE
Some New Shop Tools	1
Railroad Notes from Chicago	1
Modern Locomotive Construction. By J. G. A. Meyer	2
New Shaper	3
Gas Engine for Launches and Small Boats	3
Soda Ash for Cleaning Boilers	3
An Association of Newspaper Men	3
Opinions and Statistics	3
Recording Tool Defects	3
Patterns for Screws. By F. W. Barrows	4
Indian Castings	4
Letters from Practical Men—Skilled Machinists Needed as Much as Ever—A Log Chain Coupling. By F. L. Johnson—The Air Brake Question—Heat Boiler Pressures. By W. H. Odell—A Wire Chuck. By O. S. Walker—Exhaust Pipe for Extension Front Engines. By W. H. Thomas—That Air Trap. By John E. Sweet—An Air Pump Difficulty. By Chas. S. Beach—The Feed-Water Question. By John Coffin—Pen Attachment for the Conic Compass	4, 5, 6
American Locomotives in England	6
Quarrying Italian Marble on the American Plan	6
Governor Belt Tightener	6
A Job in a Government Railroad Shop	6
A Manufacturer's Plan for Shortening the Working Day	7
A Pair of Large Hoisting Drums	7
Minneapolis Mechanics' Institute	7
Chicago Meeting of the American Society of Mechanical Engineers	7
Association for Protection and for Boycotting	8
A Manufacturer's Eight Hour Plan	8
Manual Instruction in Schools	8
Foundry or No Foundry	8
Afraid of a Black-Ball	8

Associations for Protection and for Boycotting.

Among the recently-organized associations are the American Protective Tariff League and the Philadelphia Textile Manufacturers' Association. Edward H. Ammidown, of New York, was elected president of the former, and William Wood, of Philadelphia, president of the latter. Mr. Wood's society is calculated to include all the manufacturers of textile fabrics in Philadelphia. The *Bulletin of the Iron and Steel Association* says:

The association will have in charge the establishment of fair and uniform wages to employes; the consideration of such matters as may come before it for the prevention of strikes; the settlement of differences between employers and operatives, etc. A fund will be subscribed for the reimbursement of members for losses sustained in their business during strikes, and, when a strike occurs in any factory, all the other manufacturers are pledged to stand by one another and summarily close their mills until the terms of the employer where the strike originated are acceded to.

By the above it seems that the association is preparing for some pretty strong boycotting. This is a threat of war, not of peace. When the contest begins, it will doubtless be waged with vigor on both sides, for workers, both male and female, throughout the country, including those in unions and those unorganized, and the friends of those workers, use Philadelphia carpets, woolen goods, cotton goods, upholstery and other textile fabrics.

We are in favor of association on the part of manufacturers to treat with workers for wages on all labor questions, because the latter are largely organized into unions and insist upon negotiating upon the union basis. While the head of each establishment should manage his own business in his own way, there are labor questions that thrust themselves upon him, as, for instance, the movement for a shorter working day, that he can no more settle with his employes alone than he can settle the national debt. If the Textile Manufacturers' Association, of Philadelphia, will discard the boycotting part of its constitution, it will be capable of much good.

As the rules now stand, the whole association virtually guarantees that no member is capable of treating his employes so badly as to cause them to quit work. Either this is the situation or the members are willing to sustain a wrong if it leads to a strike.

We believe in associations of manufacturers for protection, to benefit both themselves and their employes, both as regards labor and the tariff.

A Manufacturer's Eight Hour Plan.

On another page we present details of a plan to bring about a gradual shortening of the working-day in this country, proposed by the head of a manufacturing establishment employing about four hundred men. The essential idea embodied in it seems to be the clauses defining the method of gradually reducing the hours of labor for those who are now employed, and opening the way for the employment of many who are now unemployed, without at the same time reducing wages, and with wages the ability of workingmen and their families to buy and consume agricultural products and manufactured goods.

The proposed plan will be found widely different from the methods that have heretofore been tried in this direction. We are informed that it is to be brought prominently before the manufacturers of the country, as well as before labor organizations, and machinery establishments have special interests involved, that should secure for it their careful attention.

As to the theory of an eight hour working-day, or forty-eight hour working-week, as the case may be, whatever methods may aid in bringing about such a result, machinery establishments are in a position to await the trial of such an experiment with more equanimity, than is the case with most other branches of manufacture. If the shorter day should be found to seriously restrict the production of manufactured goods, the probable outcome of this state of things would be a demand for additional machinery with which to supply any deficiency that might thus be created. If this meant an increased demand for steam engines, boilers, steam pumps, machine tools, hammers, cranes, machinists' supplies, wood-working machinery, and the like, together with a corresponding demand for their renewal as fast as worn out, machinery establishments and mechanics could bear the infliction with fortitude.

Enfield, N. H., is a place that appreciates the value of having manufactories. A Vermont woolen manufacturer has been induced to move there by the offer of a good water power, contributions amounting to $3,400, and a promise of exemption from taxation for ten years. This seems to be a pretty liberal bonus, but it is possible to exceed it. If any other manufactory is located in Enfield and obliged to pay taxes, it is a good time for some Vermont town to offer it a good, substantial bonus to leave Enfield and start up in their town. There is no justice in exemption from taxes, unless it applies to all manufactories in a town in the same degree. Old productive industries that are taxed, while new ones are exempt, will be apt to look for inducements to move elsewhere.

The workmen in a number of establishments in different parts of the country asked for eight hours as a day's work, with eight hours' pay, from the first of May. Several establishments tried it. In some instances the workmen have requested and secured a return to the old time, ten hours, and the old rates; in other instances the employers have concluded they could not successfully keep up business upon the eight hour plan, and have abandoned it. It could not be expected that a few establishments out of the large number in this country could sustain such a sacrifice as to run but eight hours, while the others run ten hours.

Manual Instruction in Schools.

While the public schools cannot teach trades they can often begin the manual training of youth so as to develop latent mechanical talent and open the way for the acquirement of special skill by the pupils. It cannot be expected that schools will be provided with completely equipped workshops to try the experiment of manual instruction. The public schools of St. Paul are trying to teach the use of simple tools, and the effort calls forth the following growl from the *Evening Dispatch* of that city:

One of the latest fads in our public schools is imposing upon the scholars the task of making models, which involves carpenter and various other kinds of mechanical work. This would be all right if there was a workroom fitted up with tools and appliances in the school building. But to ask boys to convert their parents' houses into carpenter shops and glue factories is a good deal of annoyance to the parents. Our children do not go to school to learn to do carpenter work. They can learn that after they leave school if they desire to. Manual training in schools may be a good thing, but it should not be attempted without proper appliances.

If the experiment proves satisfactory in St. Paul we have no doubt some kind of a school workshop will be provided, but the annoyance is small in comparison with the benefits conferred by manual instruction, even without a shop.

A subscriber asks if it is our custom to bind a year's numbers of the AMERICAN MACHINIST in one volume or to make two volumes of it. In all cases we make the year and the volume begin and end together, and therefore make but one volume a year. In placing the number of the volume on the frontispiece of each issue of the AMERICAN MACHINIST, the announcement means exactly what it purports to mean. We do not believe in attempting to convey the erroneous impression, by doubling up the volumes, that the paper is older than it is. It was established in 1877, and is now about midway in Vol. IX.

Foundry or No Foundry.

It is with many machine shop proprietors a question of considerable importance whether it is better to establish a foundry in connection with their machine business, or to buy their castings. The argument that because money is made in the foundry business it is better to build a foundry to save this profit, is likely to be misleading. In the instance of small and moderate-sized machine shops the amount of castings required will not be sufficient to permit of their being made at a profit, hence business must be sought outside in order to insure anything like success. Now, if the foundry part of the business is, as is generally the case where a machine shop and foundry are connected, of minor importance, it is not likely to be as well-conducted as where it is the entire or most important part of the business, and it may be a losing operation to compete for outside work.

Again, if it is possible to save a little money by making the castings required in the machine shop, it may be possible to make more money by using the means required to establish the foundry in extending the machine business. Of course this question will not be raised where there is an abundance of capital, but in the majority of instances this is not the case; capital is put into the foundry that might profitably have been used in the machine shop.

Sometimes the question of getting castings when they are wanted comes up, but in small shops, where heats cannot be taken profitably more than two or three times in the week, castings can generally be had in better time from the large foundry than they can be made.

Foundry work as a business is coming to be better understood every day, and more energy and intelligence are being put into it than ever before. This means that in the future it is to be more difficult to get a profit out of a little foundry that is really the tail to the machine shop kite. The question of foundry or no foundry is one that will bear considerable study.

While manufacturers are having an unusual amount of trouble by reason of strikes and boycotts, Mr. Morrison serenely bobs up in Congress with his tariff reduction bill, so as to still further disturb their business. It is fortunate that Mr. Morrison has only a minority following upon his tariff schemes in the House of Representatives; a fact very clearly developed by the collection of nearly one hundred letters from new members giving tariff views, which we published in our issue of Feb. 12, 1885. Mr. Morrison may try to get up a strike, but he will fail.

A reader sends us from Seminoe Mines, Wyoming Territory, a renewal of his subscription for four years, and says he is trying his fortunes there in what promises to be the new oil country. He says development has been as yet slow, but the oil found promises to be the best natural lubricator yet discovered, containing 42 per cent. of mineral sperm oil.

A novel railroad bridge has recently been constructed at Harriston, on the Toronto, Grey and Bruce Railroad. The novelty lies in constructing the bridge of old iron rails, and is said to compare favorably in cost with wooden bridges.

Afraid of a Black-Ball.

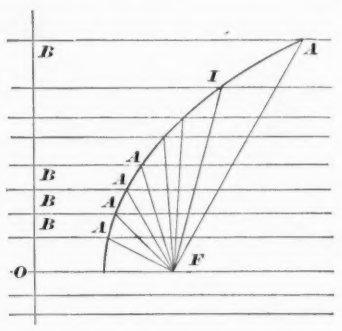
The editor of a mechanical paper published in New York, plumes himself on his wisdom in not attempting to become a member of the American Society of Mechanical Engineers, fearing, as he expresses it in his paper, that the attempt to do so "would bring the black-baller out in great force." This amounts to a clear admission that the members know him. But even an editor should know that one of the first rules of evidence provides that no man is obliged to criminate himself!

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(233) M. E. Mack, Brooklyn, N. Y., writes: The article in the AMERICAN MACHINIST of May 2, by George B. Grant, on his "Conic Compass," prompts me to asks how I can draw a parabola "which will focus the light reflected at a given point?" *A.*—The above question was referred to Mr. Grant, who says: "The language of enquiry is uncertain, but I suppose the party wants to learn how to draw a parabola that will focus light at



any given point. Any parabola will focus light at its focus. Let *F* be the given point; draw any line *O B* and *O F*, at right angles to it; lay off lines *F A*, and draw lines *A B* equal in length to *A F*. The points *A* will all be on the parabola, which may then be drawn in.

(234) G. H. L., Auburn, N. Y., writes: To decide a wager, please inform me what is the difference between "a square foot" and "a foot square?" *A.*—There is no difference; they both contain 144 square inches.

(235) J. T. S., Paulsboro, N. J., writes: How can I find or calculate the horse-power of different sizes of engines? I am running a Corliss, 12x36, 60 revolutions per minute; 70 lbs. of steam; 4½" steam pipe, 35 ft. long; exhaust pipe, 6" diameter. *A.*—The correct way to find the horse-power developed by any engine is to apply the indicator. The approximate power may be ascertained by multiplying area of piston by average pressure of steam, and by travel of piston in feet per minute. Divide this result by 33,000. The quotient is horse-power required.

(236) J. D. B., Trenton, Florida, asks for information in regard to making a "magnetic compass" for "discovering ore in the bowels of the earth." *A.*—The magnetic compass, the divining-rod and perpetual-motion humbugs should not engage the earnest attention of men who live in the 19th century. These things are relics of ignorance which have long been overthrown, and should be speedily forgotten.

(237) C. W. D., Montreal, writes: I have malleable iron parts to be case-hardened only in some places, and have tried all the usual mixtures, such as prussiate of potash, cyanide, ground glass, etc., but cannot harden sufficiently, and have to pack them in a pot with bone-dust, which makes them hard enough, but the gases generated in the process harden them all over, and as I have to do some machine work after hardening to those places not intended to be hard, find it about impossible. Is there any compound that will do the work in an open fire? *A.*—In some instances, it might be possible to do the machine work before case-hardening. In other cases treat with bone meal and anneal the articles, then machine and harden as if they were steel. It might be possible to cover the parts desired soft with clay or other material, and thus prevent action by the carbon on the parts thus protected.

(238) R. S., Greensburgh, La., asks how to temper mainsprings for gun locks. *A.*—First heat the springs, either by means of a lead bath, a hot iron, or the open fire. When the lead or sand bath is not at hand, a piece of flat iron may be laid in the fire and the spring or springs placed on the iron. Heat gradually and evenly. By the time the iron is bright red, the springs will be hot enough to harden by throwing into cool (not cold) water. To draw the temper a number of ways are open. First, smoke the spring with a burning pine knot, a bit of oily waste, or by a few drops of oil squirted on the fire. Heat the spring carefully, until the smoke is burned off, then lay one side to cool. Second method: After hardening, heat the spring until a faint trace of color can be seen in the dark, then lay one side, as before. Third method: Harden spring and cover with oil or tallow, heat until oil evaporates, then oil again, and heat as before; when the spring is so hot that the oil catches fire, or blazes off, then lay one side, as before, to cool. Failure to make good springs is more often in the forging and heating than in the tempering. Either of the above methods will give good results, if care is taken in all manipulations.

(239) C. M., Philadelphia, Pa., asks how to get the highest results and best circulation from a steam boiler in hot-house. "One person claims that the return pipe to boiler should be in its lowest point, 18" above boiler water line." Another says, "Bring return pipe as soon as possible below water line, in both cases to dip and come up again, forming an inverted syphon before entering the boiler, even with the use of a check valve." A third person runs return-pipe straight into boiler with check valve placed close to boiler. *A.*—We prefer a return pipe should be as straight as possible, and that it should enter the boiler at the bottom. Local conditions vary so much that the course of a return-pipe must vary greatly, but we prefer to dispense with all traps and siphons if possible. 2. What kind of boiler would you prefer, locomotive, return tubular, or sectional? *A.*—The location and condition under which the boiler is to be used must determine this point.

(240) E. M. B., Charleston, S. C., writes: I have four boilers, two of which are set 9" from the fronts. The boilers are suspended, and gauge-cock pipes go through the front into boilers, and one of the pipes carries an off-set. A 2" pipe leads from all the boilers for taking steam for use around the mill. Some one let steam into one boiler while it was cold, and filled in three gauges of condensed water before I discovered it. The off-set gauge-pipe broke off in the cock from expansion of boiler, the front not moving, as it would in case of a regular firing up. I find nothing wrong with the seams of the boiler, and would it be safe to use? *A.*—Turning steam into a cold boiler is a most pernicious and dangerous practice, especially if the cold boiler is partly filled with water. Such being the case, the upper part of boiler would expand, while the lower portion, being cold, would remain of the same length. This treatment would cause the most severe strains imaginable. A boiler, after being subjected to such usage, should be most critically inspected and tested before being put to work.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Patent Att'y, H. W. T. Jenner, Washington, D. C.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

T. M. Parker, Steel Stamps, Stencils, Hartford, Ct.

J. Clayton, Air Compressors, Rock Drills, 43 Dey st, NY

Edw. Sears, Wood Engraver, 48 Beekman st., N.Y.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

Tack, Wire and Shoe Nail Machinery. Wm. A. Sweetser, Brockton, Mass.

Selden Packing, for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., NY

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

"Modern Steam Engines," $6; "Mechanical Drawing Self-Taught," $4 Joshua Rose, Box 3306, N. Y.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Foot-power Machinery, for workshop use, sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Improved Labor-saving Upright Drills, 20-in. to 36-in., inclusive. Currier & Snyder, Worcester, Mass.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 93 John st., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys Yocum & Son's Shafting Works, Drinker st., Philadelphia, Pa.

"Morrison's Practical Engineer." A complete treatise (200 pp.) on steam and general mach. Mailed on receipt of $1. W. A. Morrison, Box 373, Lowell, Mass

Engine Lathes, Hand Lathes, and other fine tools, Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

Curtis Pressure Regulators, Curtis Return Trap Curtis Damper Regulator. See May 1, p. 10. Send for circular No. 17. Curtis Reg. Co., Boston, Mass.

Wanted—Numbers 1, 2 and 4 of volume IV., 1881; must be in excellent condition for binding, if soiled we cannot use them; for copies described as above we will pay 25c. each, and prefer to have the whole three if possible. Parties favoring us will kindly write name and address on wrapper. AM. MACHINIST Publishing Co., 96 Fulton street, N. Y.

Bound Volumes of the AMERICAN MACHINIST for the years 1880, 1881, 1882, 1883, 1884 and 1885. These volumes are strongly bound in cloth, and will wear well. Price $3.50 each; express charges additional. AM. MACHINIST PUB'G CO., 96 Fulton st., N. Y.

St. John Improved Self-adjusting Cylinder Packing, for marine and stationary engines and locomotives; applicable to water, air, oil and ammonia pumps. For durability and minimum of friction, it is unexcelled. Send for pamphlet. Address, Balance Valve and Piston Packing Co., room 58, 280 Broadway, New York.

Patent Binders for the AMERICAN MACHINIST, holding a complete volume (52 issues), simple, neat, durable. Price $1, prepaid, to any part of the United States by mail. To Canada or foreign countries the price will be 75c.; purchasers pay express charges and customs duties. AM. MACHINIST PUB'G CO., 96 Fulton st., N. Y.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price, $2, post-paid. Published by John Wiley & Sons, 15 Astor Place, New York.

MANUFACTURES

The Boston & Lowell Railroad have placed a 50-car order with the Laconia (N. H.) Car Company.

The B. C. R. & N. R. R. Co., of Burlington, will erect a new round-house at Iowa Falls, Iowa.

John McCosh, of La Grange, Ga., will build a cotton mill.

T. L. Smith, of Wausau, Wis., contemplates starting a foundry and machine shop at Reedsburg.

Spence, Boggs & Co., Martin's Ferry, Ohio, will build a large new foundry at once to accommodate their increasing trade.

The large machine works of E. P. Allis & Co., Milwaukee, Wis., are running with a full force of men, except in the wood-working department.

$23,000 has been subscribed towards the organization of a stock company at Reidsville, N. C., to build a cotton factory.

J. H. Horn & Son, South Lawrence, Mass., are to erect a brick machine shop, 300x64 ft. The power will be furnished by a 150-horse-power engine.

The United States Wire Nail Company, Indianapolis, Ind., is erecting a two-story addition, 40x160 feet.

The Spangler Manufacturing Company, York, Pa., is building a large factory for the manufacture of agricultural implements.

The Stanley Mfg. Co., Lawrence, Mass., have recently placed two Beaudry upright power hammers in their works.

The North Wayne (Me.) Tool Company intend to increase the capacity of their works by putting in new grinding machinery.

We understand that Morris Tasker & Co., of Philadelphia, have quit making boiler tubes. Boiler tubes have advanced 2½ per cent.

The town of Fryeburg, Me., has voted adversely on the proposition to appropriate $15,000 to build a shoe factory.

Atwood & Son, Stonington, Conn., have purchased a large building formerly used as a furniture factory, and will fit it up for the manufacture of silk.

Harmon, Gibbs & Co., Corry, Pa., will erect a foundry addition to their engine and oil well supply works, 110x45 feet.

Sumter, S. C., will decide by popular vote, June 8, whether to spend $20,000 in enlarging their water-works.

The Old Irondale Furnace of T. Nemegyei, Raccoon, W. Va., is being replaced by a new furnace, to have a weekly capacity of 225 tons.

The Crane Brothers Mfg. Co., of Chicago, announces that after June 17 it will run its works 55 hours per week.

The Cable and Western Railway Co., of St. Louis, will build a car shop and round-house on Morgan street, between West street and Vandeventer avenue.

The East Tennessee, Virginia & Georgia Railroad Co. have purchased 35 acres of land at Chattanooga, Tenn., which, it is said, will be used as a location for large shops, or as a switching yard.

The Pittsburgh, Cincinnati & St. Louis Railroad Company will immediately commence work on new car shops, 600x300 feet, to be built of iron, at Dennison, Ohio.

The Phœnix Iron Works, Minneapolis, Minn., have made arrangements to erect extensive buildings at St. Cloud, and will remove its shops there at an early date.

The Omaha Barb Wire Co. are erecting new buildings in that city, and will increase their plant for the manufacture of barb wire, and will also introduce machinery for the manufacture of wire nails.

At Dallas, Texas, the gas company's hands, eight in all, struck for eight hours' work. They are only required to work six hours a day, and struck just because they had the strike fever.—*Brenham Banner.*

The Tubal Cain Iron Works, lately incorporated with a capital of $150,000 for the manufacture of all kinds of heavy forgings, are looking for a suitable site upon which to build their works.—*Chicago Industrial World.*

W. E. Nichols, Baldwinsville, Mass., is erecting a shop 100x40 ft., to be used as a chair and wood-working machinery manufactory. About 30 hands will be employed, and it is expected to start up about August 1.

The wages of the employes of the Union Foundry and Machine Company, Catasauqua, Pa., have been increased 10 per cent., and a similar increase has been given the furnace laborers of the Crane Iron Company.

The machine and blacksmith shop of Charles Ruter, Millview, Fla., reported in this issue as burned, loss $8,000, will be rebuilt at once, the new machinery having been already ordered.—*Baltimore Manufacturers Gazette.*

Bradley & Co., Syracuse, N. Y., in addition to manufacturing cushioned helve-hammers and agricultural machines, make some select styles of fine carriages. A circular has just been issued of the Bradley Handy Wagon, which has met with great popular favor. Its features are simplicity, lightness, convenience, and low price.

Warner & Hough, the proprietors of the Delaware Machine Company, at Wilmington, Del., have decided to move to St. Paul, Minn. Their plant will consist of an iron foundry, brass foundry and machine shop, and will be very extensive. The cost of the plant will be about $175,000, and over 100 men will be employed.—*Sanitary News.*

The plan of forming a co-operative britannia shop is agitated in Meriden, Conn., and prominent members of the Knights of Labor state that the scheme will be brought to a head. There are said to be over 400 people in that city, Middletown, and New Britain who are willing to put in at least $25 each to back the enterprise.

The largest dynamo in the world is being set up in Cleveland. It will be 13 feet long, 5½ wide, and weigh ten tons—four times the size and ability of the "Jumbo" machine exhibited by Edison at the Philadelphia Exposition in 1884. Five hundred horse-power will be required to drive it, and its current will furnish incandescent lights of about 20,000-candle-power.

The Wampum Iron Works, Wampum, Lawrence County, Pa., were on the 14th inst. sold to T. B. Kettler, the former manager, for $5,000. The works were built at a cost of $17,000, and at the time of their suspension had orders far in excess of their capacity, but the stockholders got to fighting and the company filed an assignment.—*American Manufacturer.*

The Buffalo Hammer Co., Buffalo, will at once begin the erection of works, with double their present capacity, at Black Rock, near Buffalo. They will manufacture a line of hatchets, stone and masons' hammers, sledges, railroad spike mauls, etc. They expect to be in full operation in their new works by July 15. They have added a large outfit of new machinery.—*Railway Review.*

The De La Vergne Refrigerating Machine Company, Bank street, New York, are building a 50-ton ice machine for the Jung Brewing Co., Cincinnati, Ohio, and the Bartholomay Brewing Co., Rochester, N. Y.; also a 4-ton machine for the Joseph Schlitz Brewing Company, Memphis, Tenn., and a 9-ton machine for the Murray Hill Hotel, New York. Their employes work nine hours.

The Cohoes Iron Foundry and Machine Company, Cohoes, N. Y., has issued an elaborate leather-covered circular of their specialties. It contains illustrations and descriptions of elevators and hoists in a large variety, and for all purposes; also motors, including electric motors, for their operation. In addition to these, a variety of machines which they manufactnre for sizing and dressing warps are shown, and pumps for various purposes. water-wheel governors, hydrants, electric time keeper for night watchmen, and other machines are illustrated. The catalogue is excellently well illustrated and printed, and contains, in many instances, prices of machines and parts.

The *Springfield Republican* has the following note about the Ames Mfg. Co., Chicopee, Mass.: "A director in the concern said last week that it would take at least $100,000 to start the works in full blast again. He thought that the name of the concern would soon be changed, and that better times could be hoped for in about a year, but not much sooner. Outside parties have offered $150,000 for the entire business, but a settlement has not been effected yet, and probably will not be right away. There has been considerable talk of transferring the entire business of the Deane Pump Works to Chicopee, and some of the managers of both companies have expressed themselves in sympathy with the project."

Wm. T. Bate & Son, Conshohocken, Pa., having amicably settled their suit against the Pennsylvania Railroad for encroachments on the part of the new Schuylkill Valley branch of that road, have decided not to remove their boiler works to Bridgeport, Pa., as first intended, and where they had bought ground and built a new factory for the purpose. The business is to remain in the Conshohocken shops, where important additions and improvements have been made. Messrs. Bate & Son will continue to build the Bate steam generator as formerly. They are also doing considerable work in the erection of gas works by the Flannery process in Jersey City, Chicago, and Pittsburgh, and are now finishing up on two sets at Staten Island. Two of the Bate boilers are included in the Jersey City plant.

The Yale & Towne Mfg. Co. has, within the past few months, furnished the Washburn & Moen Mfg. Co., of Worcester, a 30-ton testing machine for tests of tension, built on the plate fulcrum system of Mr. Emery. It has also furnished the Union Iron Mills Dept., Messrs. Carnegie Brothers & Co., Ltd., Pittsburgh, with an emery hydraulic testing machine for tension, compression and transverse tests of a capacity of 75 tons, and has furnished Cambria Iron Company, Johnstown, Pa., with a similar hydraulic machine of a capacity of 150 tons. These latter machines are built on the same principle as the 400 ton Government testing-machine in use at the Watertown arsenal. It has also just built, and has in stock, two 75-ton machines and one 150-ton machine. Besides other inquiries, it has perfected plans and is in negotiation with two important concerns for testing machines of a capacity of 1,000,000 pounds each. These machines would be capable of testing specimens of tension up to 90 feet in length, and for compression up to 30 feet, thus being capable of testing entire members of bridge or other structures, instead of guessing at results from testing small specimen pieces. The value of accurate tests of material is becoming more widely recognized than ever by manufacturers, hence the demand for machines such as above noted.

Machinists' Supplies and Iron.

NEW YORK, May 27, 1886.

There has been no improvement in the demand for iron. Consumers are absorbing a large amount of stock on previous orders.

In American pig, buyers have been inclined to stock up a little more freely, but the absence of fresh orders to manufacturers is discouraging. We quote Standard Lehigh and North River brands $18 to $18.50 for No. 1 X Foundry; $17 to 17.50 for No. 2; and $16 to $16.50 for Grey Forge.

Scotch Pig—The market is quiet, and trade rules of a retail character. We quote Coltness, $20; Glengarnock, $19; Gartsherrie, $19.50; Summerlee, $19.50; Eglinton $17.50 to $18; Langloan, $19.50, and Dalmellington, $18.50.

Copper—The recent transactions in 12,000,000 pounds at 10 cents by the Calumet and Hecla have tended to stagnate operations in this metal. Supplies have been recently purchased at 11c. to 11¼c.; Western brands at 10c. to 10½c.

Antimony—No quotable change. Hallett's, 8⅜c.; Cookson's, 8⅞c.

Lead—Spot, 4.70c.

Tin—Banca, 22¼c. to 22½c.; Straits and Mallacca, 21.35c. cash, and 21.40c. 30 days.

Spelter—Refined, 5¾ to 6c.

WANTED

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—By a young man, 4 years' shop experience, a position as assistant mechanical draftsman. Address W. W. Graham, AM. MACHINIST.

Draftsman, competent and reliable, with experience on hoisting machinery, turbines, mining machinery, etc., desires situation. Address H. H., AM. MACHINIST.

Wanted—Competent and experienced draftsman on hoisting and mining machinery; state age and extent of experience; also salary expected. Address Box 164, Cleveland, Ohio.

Wanted—A young man of good address and thoroughly posted on steam boilers, engines, pumps, etc., as salesman. Address Box No. 476, Philadelphia Postoffice, Pa.

Wanted—A first-class foundry foreman, who is capable of handling men, understands the mixing of iron and a foundry in all its details; must have good references. Address Iron, AM. MACHINIST.

Wanted—First-class practical mechanic and manager wishes to correspond with parties in need of a foreman or supt. of machine works; first-class references given. Address Box 13, AM. MACHINIST.

Wanted—By a practical iron and brass foundryman an opportunityto engage as partner in the foundry business, or in machine and foundry business; have been 18 years manager, and can give and will expect the best of references; can furnish some capital. Address Iron Foundry, Box 12, AM. MACHINIST.

Wanted—Foundry foreman wants position; is 35 years of age, and has had 11 years' experience as superintendent of foundries on large variety of work and management of men; can give first-class reference, and good reasons for wishing to leave present position. Address "Energetic," AM. MACHINIST.

Wanted—A practical man as foreman of machine shop; one with strictly temperate habits, industrious, accustomed to handling men, and experienced on automatic and plain engines, blast furnace, architectural and iron house work, locomotive and general repairs; none other need apply. Address, stating experience, reference and salary expected, "Manufacturer," AM. MACHINIST.

✝ MISCELLANEOUS WANTS ✝

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Crescent Boiler Compound; ever reliable, never failing. Crescent Mfg. Co., Cleveland, Ohio.

Send for estimates of high-speed compound engines for stationary and marine service. Crist Engine Works, 140 Baxter street, N. Y.

Useful information steam users and engineers 100 page book on care, etc., of boilers. Send 25 cents in stamps. J. N. Mills Pub. Co., 30 Vesey st., N. Y.

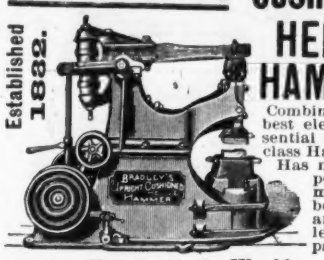
Special tools and machines for mfg. designed and built to order; mechanical and Patent Office drawings. Weston & Smith, Syracuse, N. Y.

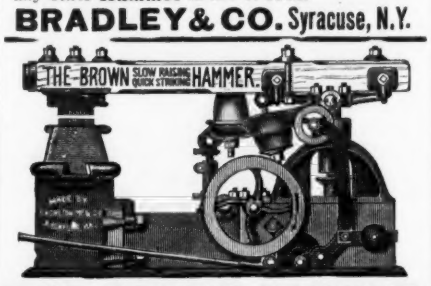
For Sale—The patent on stock and die; diploma from American Institute for same. Address G. E. H., Box 485, Sing Sing, N. Y.

M. Martin, manufacturer, P. O. Box 285, New Brunswick, N. J., will contract for the manufacture of articles in brass and other metals (stamped or turned), and dies and tools for making same; also patent novelties, electrical inventions, special machinery castings, etc.; estimates cheerfully given.

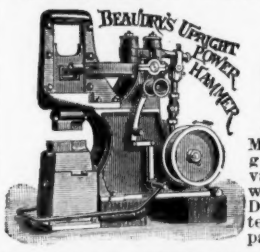
For Sale—A well established foundry and machine shop, including lots, buildings, machinery, patterns, and stock on hand, situated in Logan, Hocking Co., Ohio; will sell on easy and satisfactory terms; reason for selling—old age and ill health. Apply to R. Belt, Logan, Ohio.

WHITE'S FLEXIBLE METALLIC FILLET
For use of Pattern Makers. Sizes 1 4 to 1 in.
HOWARD WHITE, 44 N. 4th ST., PHILA. PA.
½" ⅜" 5/16" ¼"
Send for Circular & Samples.

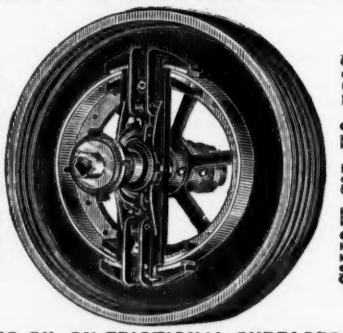
BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER
Established 1832.

Combines all the best elements essential in a first-class Hammer. Has more good points, does more and better work and costs less for repairs than any other Hammer in the World.
BRADLEY & CO. Syracuse, N.Y.



THE BROWN HAMMER
STRIKES A BLOW WITH DOUBLE THE VELOCITY That it Raises The Hammer.
A NEW MOVEMENT! SEND FOR DESCRIPTION.
KNOWLTON MFG. CO., King St., Rockford, Ill.

BEAUDRY'S UPRIGHT CUSHIONED POWER HAMMER.


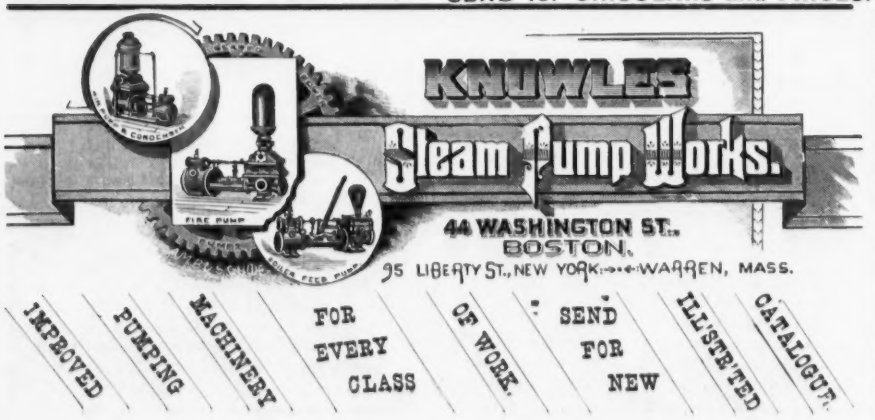
The success of our Machine is the best guarantee of its value. Only Machine with Double Helve Does more and better work with less repairs than any other.
BEAUDRY & CUNNINGHAM, Boston, Mass.

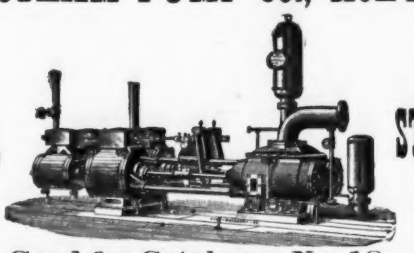
HILL'S FRICTION CLUTCH
Sent on Trial.

Sold on Its Merits
NO OIL ON FRICTIONAL SURFACES.
Abundant Clearance, Positive Release.
Only CLUTCH Having REMOVABLE Hub.
Send for Catalogue. BELOIT
ECLIPSE WIND ENGINE CO., WIS.

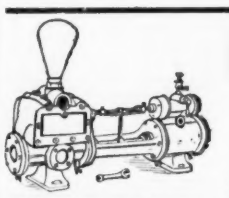
STEPHENS VISES.

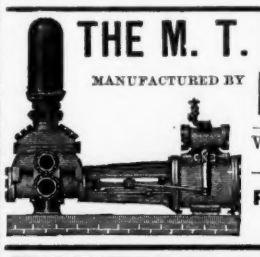
50 Per Cent of time and labor saved by using this solid, strong, durable, quick-working Vise. Has the improved taper pipe, and other attachments. Sold by the trade. Send for circular.
MELVIN STEPHENS, Prop'r. Office, 41 Dey St., New York.

William Barker & Co.
MANUFACTURERS OF
IRON AND BRASS WORKING MACHINERY.
140 and 142 E. Sixth St., Near Culvert,
CINCINNATI, O.
SEND for CIRCULARS and PRICES.

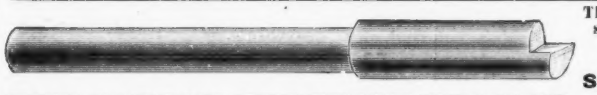

KNOWLES
Steam Pump Works.
44 WASHINGTON ST., BOSTON.
95 LIBERTY ST., NEW YORK. WARREN, MASS.
IMPROVED PUMPING MACHINERY FOR EVERY CLASS OF WORK. SEND FOR NEW ILLUSTRATED CATALOGUE.

THE DEANE STEAM PUMP CO., HOLYOKE, MASS.
BUILD WATER WORKS, ENGINES AND STEAM PUMPING MACHINERY.

Send for Catalogue No. 18.


SINGLE STEAM PUMP.
DELAMATER STEAM PUMPS
FOR ALL KINDS OF SERVICE.
Manufactured by C. H. DELAMATER & CO., (Delamater Iron Works)
Warerooms, 16 Cortlandt Street, New York.

THE M. T. DAVIDSON IMPROVED STEAM PUMP

MANUFACTURED BY DAVIDSON STEAM PUMP COMPANY.
WARRANTED THE BEST PUMP MADE FOR ALL SITUATIONS.
PRINCIPAL OFFICE, No. 77 LIBERTY STREET, N. Y.
NEW ENGLAND OFFICE, 51 OLIVER STREET, BOSTON, MASS.

We shall be pleased to mail, on application, to all that are interested in our articles a copy of our New Illustrated Catalogue, just issued.
SCHAFFER & BUDENBERG,
40 John Street, New York.


The only Reamer that will keep its size, and always make a straight hole. As easily sharpened as a Lathe Tool.
Syracuse Twist Drill Co.,
THE CANNON CHUCKING REAMER. SYRACUSE, N. Y.
Agents: H.H. & C.L. MUNGER, Chicago, Ill. R.C.GRAVES, 72 Reade St., N.Y.

FOR SALE AT A BARGAIN.
A well established and good paying machine shop and foundry, including buildings, lots, machinery and stock, situated in Leadville, Col. The business will be carried on until sold, thus at once giving a profitable trade to the purchaser. Address,
A. FALKENAU,
Care of Dickson Mfg. Co.,
Scranton, Pa.
Only reason for selling, ill health.

EMERY-WHEEL TOOL GRINDER.
Four Sizes.
Guaranteed Satisfactory
Write for Illustrated Circular.
Pat. Sept. 25, 1883.

SPRINGFIELD GLUE & EMERY WHEEL CO., Springfield, Mass
Water runs on wheel and prevents beating.

H.W. JOHNS' ASBESTOS ROOFING
FIRE AND WATER-PROOF BUILDING FELT, FIRE-PROOF PAINTS, STEAM PACKINGS, BOILER COVERINGS, ETC.
Samples and descriptive Price List free by mail.
H. W. JOHNS M'F'G CO., 87 MAIDEN LANE, N. Y.
CHICAGO, PHILADELPHIA, LONDON.

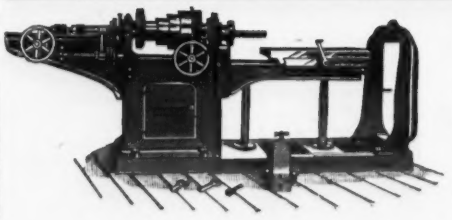
THE CELEBRATED
HEALD & SISCO CENTRIFUGAL PUMPS
Vertical and Horizontal.

SEND TO 22 CORTLANDT ST., NEW YORK.
In Writing, Mention this Paper,

PATENT UNIVERSAL SCREW-CUTTING, CENTER, DEPTH, ANGLE AND TWIST DRILL GAUGE.
J. WYKE & CO.
Fine Machinists' Tools, E. BOSTON, MASS. Send for Circular.

STEWART'S PATENT READY ROOFING
For ROOFS OF ALL DESCRIPTIONS, steep or flat, can be applied by ordinary workmen having no previous experience. Send for Samples and Illustrated Pamphlet. Address
W. H STEWART,
74 Cortlandt Street, New York.
IRON-FIBRE PAINT, for Roofs and Factory and Farm Buildings.

THE HENDEY MACHINE COMPANY.
MANUFACTURERS OF
TORRINGTON, CT.
SEND FOR CATALOGUE
Machinists' Tools, LATHES, PLANERS, SHAPERS, DRILLS, ETC., ETC.


BETTS MACHINE COMP'Y,
WILMINGTON, DEL.,
MAKERS OF
Metal-working Machine Tools
OF SUPERIOR QUALITY,
FOR USE IN
MACHINE AND RAILWAY SHOPS.

NICHOLSON FILE CO.,

SOLE MANUFACTURERS OF

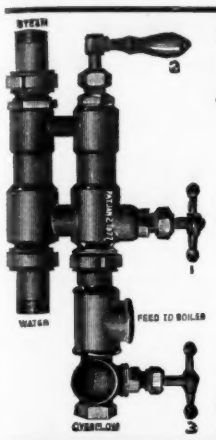
FILES AND RASPS

HAVING THE INCREMENT CUT.

Also, FILERS' TOOLS AND SPECIALTIES.

"Nicholson File Co.'s Files and Rasps, "Double Ender" Saw Files, "Slim" Saw Files, "Racer" Horse Rasps, Handled Rifflers, Machinists' Scrapers, File Brushes, File Cards, Surface File Holders, Vise File Holders, Stub Files and Holders, Improved Butchers' Steels.

Manufactory and Office at PROVIDENCE, R. I., U. S. A.



THE HANCOCK INSPIRATOR.

THE STANDARD

BOILER FEEDER FOR ALL CLASSES OF BOILERS.

OVER 75,000 IN USE.

Send for Circulars and Price Lists.

THE HANCOCK INSPIRATOR CO.

OFFICE, 33 INDIA WHARF, BOSTON, MASS.

THE NEW "CRESHAM" PATENT Automatic Re-Starting INJECTOR

"Invaluable for use in Traction, Farm, Portable Marine and Stationary Boilers of all kinds. No handles required. Water supply very difficult to break. Capability of restarting automatically immediately after interruption to feed from any cause."

☞Send for Catalogue. Reliable and Cheap.

Sole Manufacturers in the United States and Canada,

NATHAN MANUFACTURING CO.

Nos. 92 and 94 LIBERTY STREET, NEW YORK.

Established in 1874.

CLEVELAND TWIST DRILL CO.

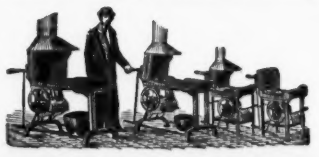
24 and 26 West Street, Cleveland, O.
191 Chambers Street, New York.
85 Queen Victoria St., London, Eng.

P.H. & F.M. ROOTS,

Connersville, Indiana,

MANUFACTURERS OF

PORTABLE FORGES, TUYERE IRONS, ETC.



ROOTS' NEW ACME HAND-BLOWERS.

Slow-speeded, Force-blast. Durable, Compact and Cheap.

Roots' Foundry Blowers, Gas Exhausters, etc.

S. S. TOWNSEND, Gen. Agt. } 22 CORTLANDT ST.,
COOKE & CO., Selling Agts., } NEW YORK.

In Writing, Please Mention This Paper.

FITZGERALD'S BOSTON MACHINIST. 18mo, cloth.	$ .75
CHORDAL'S LETTERS TO MECHANICS, &C 12mo.	2.00
THURSTON'S MATERIALS OF CONSTRUCTION. 8vo.	5.00
THURSTON'S FRICTION, IN MACHINERY, &C. 8vo.	3.00
WEST'S FOUNDRY PRACTICE. 12mo, plates.	2.50
WEST MOULDER'S TEXT-BOOK. 12mo, plates.	2.50
MCCORD'S PRACTICAL MECHANISM 8vo.	5.00
WRINKLES AND RECIPES FOR MECHANICS AND ENGINEERS	2.00
GRIMSHAW'S ART OF SAW FILING. 18mo, plates.	1.00
HOLLY'S " " " 18mo, plates.	.75
BALDWIN'S STEAM HEATING FOR BUILDINGS	2.50
CROMWELL'S TOOTHED GEARING, &C. 12mo.	2.00
CROMWELL'S BELTS AND PULLEYS. 12mo.	2.00
SINCLAIRS' LOCOMOTIVE ENGINE RUNNING, &C. 12mo	2.00
THURSTON'S STATIGNARY STEAM ENGINES. 12mo.	1.50
GRIMSHAW'S STEAM ENGINE CATECHISM	1.00

Published and for Sale by

JOHN WILEY & SONS, 15 Astor Place, N.Y.

DIXON'S SILICA-GRAPHITE ROOF-PAINT

Will cover twice the surface of White Lead. Two coats will last on a tin roof ten years.

SEND FOR CIRCULAR AND TESTIMONIALS.

JOS. DIXON CRUCIBLE CO.

Jersey City, N. J.

SEBASTIAN, MAY & COMPANY'S Improved Screw Cutting Foot or Power Lathes

Catalogue of Lathes, Drill Presses and Machinists' Tools and Supplies mailed on application. Lathes on Trial.

167 W. Second St., Cincinnati, O

LIGHT MACHINERY BUILT TO ORDER

AT SHORT NOTICE AND

SATISFACTION GUARANTEED.

EDMUND MILLS,

Successor to Pennington & Mills.

8 Dey Street, Jersey City Heights, N. J.

Facilities for manufacturing small work in quantity.

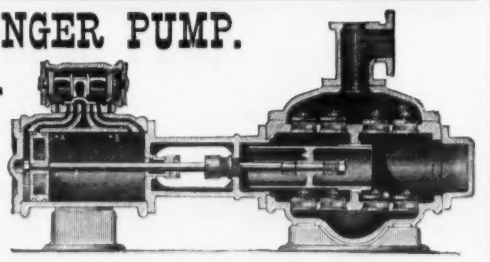
HALL DUPLEX PLUNGER PUMP.

Simple, Durable, Efficient.

HALL STEAM PUMP CO.,

91 Liberty St.,

NEW YORK.



REDUCED PRICES OF LeCount's Light Steel Dog

No.	INCH.	PRICE.	No.	INCH.	PRICE.
1	5/16	$ .35	8	2	$1.10
2	1/2	.35	Small Set of 8		5.50
3	3/4	.50	9	2 1/4	1.40
4	1	.60	10	3	1.50
5	1 1/4	.75	11	3 1/4	1.70
6	1 1/2	.85	12	4	1.90
7	1 3/4	1.00	Full Set of 12		12.00

C. W. LECOUNT,

SOUTH NORWALK, CONN.

SHEPARD'S NEW $60 SCREW-CUTTING FOOT LATHE.

Foot and Power Lathes, Drill Presses, Scroll-saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers, etc.

Lathes on trial. Lathes on payment.

Send for catalogue of Outfits for Amateurs or Artisans.

Address, H.L. SHEPARD, Agent, 134 E. Second St., Cincinnati, O.

OUR NEW CATALOGUE OF TOOLS

and Supplies sent free to any address on receipt of ten cents in stamps (for postage).

Chas. A. Strelinger & Co., Wood Ave., Detroit, Mich.

WELDLESS STEEL QUICK OPENING GATE VALVE COLD DRAWN TUBES

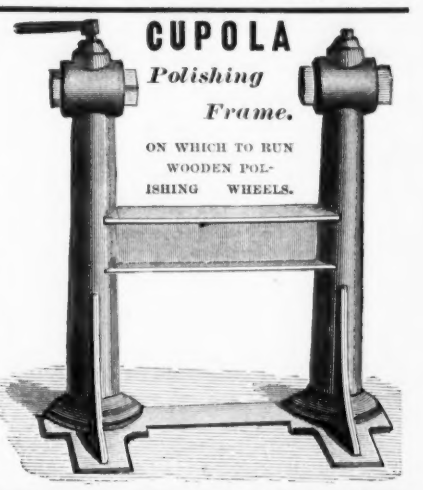
SMOOTH INSIDE & OUT.

JOHN S. LENG, 4 Fletcher St N.Y.

CRANK PLANERS

Superior Design & Workmanship, Extra Heavy (1500 lbs.) DOWN, ANGULAR AND CROSS-FEED. TO PLANE 12x16x15.

THE R. A. BELDEN CO., DANBURY, CT.



Emery Wheels, Grinding Machinery and Tools, and Polishing and Plating Goods of all kinds.

UNION STONE COMPANY,

38 and 40 Hawley St., BOSTON, MASS.

WATER WORKS MACHINERY A SPECIALTY.

Cor'sp'd'ce Solicited. POND ENGINEERING CO. St. Louis, Mo.

SEND FOR CUTS AND PRICES OF OUR

NEW 16-IN. ENGINE LATHE.

THE MULLER MACHINE TOOL CO., 182 W. PEARL ST., CINCINNATI, O.

Suckow's Patent Extension Jack

The best wrecking screw jack made, because of ready adjustment to unusual positions. The load can be in almost any position, allowing the screw to work freely without the use of packing strips or wedges to give equal bearings. A complete carrying or straight jack. Circulars and prices on application.

PEDRICK & AYER, Philadelphia, Pa.

WHY THIS IS PUT HERE!

For the reason that if you are interested in raising water or other liquids by steam power, we wish to call your attention to the

NEW PULSOMETER,

THE CHEAPEST AND BEST STEAM PUMP IN THE MARKET. PRICES LOWER THAN ANY OTHER.

More Efficient, Simple, Durable, and more Economical, both as to running expenses and repairs, than any other Steam Pump.

Call or write for our new 96 page Illustrated Descriptive Book containing Full Particulars, Reduced Net Prices, and hundreds of A-1 Testimonials. Mailed Free.

PULSOMETER STEAM PUMP CO., 83 JOHN STREET, N. Y.

Joshua Rose's Great Treatise on Steam Engines

JUST PUBLISHED.

MODERN STEAM ENGINES.

An Elementary Treatise upon the Steam Engine, written in Plain Language, for use in the Workshop as well as the Drawing Office: Giving Full Explanations of the Construction of Modern Steam Engines; Including Diagrams showing their actual Operation; Together with Complete but Simple Explanations of the Operations of Various Kinds of Valves, Valve Motions, Link Motions' etc., thereby enabling the Ordinary Engineer to clearly Understand the Principles Involved in their Construction and Use, and to Plot out their Movements upon the Drawing Board. By JOSHUA ROSE, M.E. author of "The Complete Practical Machinist." Illustrated by 422 engravings. In one volume, 4to, 320 pages *Price, $6.00, free of postage to any address in the world.*

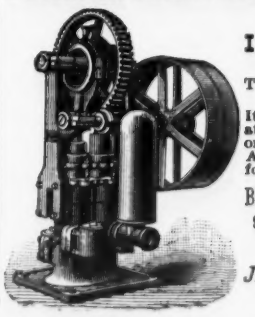
☞ *An Illustrated Circular, 8 pages, 4to, giving the Contents of this remarkable Book, will be sent free to any one who will furnish his address.*

HENRY CAREY BAIRD & CO.,

Industrial Publishers, Booksellers and Importers,

810 Walnut St., Philadelphia, Pa. U.S.A.

THE ECONOMIC PATENT BOILER FEED PUMP



Manufactured by

I. B. DAVIS & SON,

Hartford, Conn.

The Only Double-Acting Geared Pump.

It is compact and Systematic in design and Economical in its operation. All its parts are arranged for durability.

BENJ. F. KELLEY, Agent,

91 Liberty St., New York.

Philadelphia Office:

JAMES BERRYMAN,

135 North Fourth St.

Buffalo Cupola & Forge Blowers.

Warranted superior to any other make.

All sizes and styles of every class of work.

BUFFALO FORGE CO.

Buffalo, N. Y.

Send for Catalogue and prices

WORTHINGTON PUMPING MACHINERY

HENRY R. WORTHINGTON,

NEW YORK,

Boston, Pittsburgh, Chicago, Cincinnati, Cleveland, St. Louis, San Francisco.

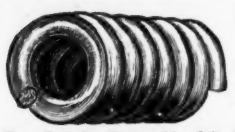
SEND FOR Illustrated Catalogue.

SAFE ECONOMICAL DURABLE BOILERS
HARRISON SAFETY BOILER WORKS. PHILADELPHIA. PA.
MERITS PROVEN 20 YEARS RECORD

Oneida Steam Engine & Foundry Co., Oneida, N. Y.
Manufacturers of all kinds of LATHE AND DRILL CHUCKS
Under Westcott's Patent.
SEND FOR CATALOGUE.

Capacity Little Giant Improved.		
No. 00.	.....holds 0 to	¼ inch.
" 0	..... " 0 to	½ "
" 1	..... " 0 to	⅝ "
" 2	..... " 0 to 1	"
" 2½	..... " 0 to 1	"

Selden's Patent Packings



Recommended by Leading Engineers for Steam and Hydraulic Use.
Made either *with* or *without Rubber Core.*
Randolph Brandt, 38 Cortlandt St., N. Y.

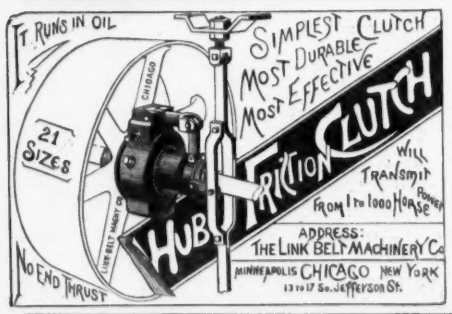
Office of James Renshaw,
Mechanical Engineer; Mill and Mining Machinery and Engineers' Supplies.
Butte, Montana,
Randolph Brant February 22, 1884.
In answer to your inquiry in reference to the Selden Packing, I can say that, having used a great deal of it in almost every situation, and for a long time, and since sold a great deal to other users, I can testify to its merits. Where one packing is to be used for packing against both steam and water, I know of none equal to it. That with rubber core I have found excellent for high temperatures. While there are several really good packings in the market, yours need "take no back seat," with any.
Yours truly,
JAMES RENSHAW.

J. C. HOADLEY,
CIVIL AND MECHANICAL ENGINEER
and Expert in Patent Causes,
28 STATE STREET, ROOM 28, BOSTON, MASS.

HODGE'S
Universal Angle Union
PATENTED.
Combining an elbow and union, and can be set at any angle at which it is desired to run the pipe.
Manufacturers & Wholesale Agents
ROLLSTONE MACHINE CO., 45 Water St., FITCHBURG, MASS

SHAPING MACHINES
For Hand and Power, 6", 8" and 10" Stroke.
Adapted to all Classes of Work to their capacity.
CIRCULARS FURNISHED.
BOYNTON & PLUMMER,
Worcester, Mass.

Barnes' Foot-Power Machinery.
Complete outfits for Actual Workshop Business. Read what a customer says: "Considering its capacity and the accurateness of your No. 4 Lathe, I do not see how it can be produced at such low cost. The velocipede foot-power is simply elegant. I can turn steadily for a whole day and at night feel as little tired as if I had been walking around." Descriptive Catalogue and Price List Free. W. F. & JOHN BARNES Co. Address 1995 Main St., Rockford, Ill.



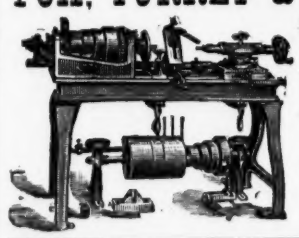
EUREKA BAND SAW.

We build three sizes, at prices lower than an equally good Band Saw can be had elsewhere. For further information, inquire of
FRANK & CO.,
176 Terrace Street,
BUFFALO, N. Y.

FORBES & CURTIS,
BRIDGEPORT, CONN.
Manufacturers of
The Forbes Pat. Die Stocks,
Power Pipe Cutting and Threading Machines, Cutting-off Machines, Ratchet Drills, Special Machinery, etc., etc.
WRITE FOR CATALOGUE.
Mention Paper.

VOLNEY W. MASON & CO.,
Friction Pulleys, Clutches and Elevators
PROVIDENCE, R. I.

FOX, TURRET & SPEED LATHES AND BRASS FINISHERS' TOOLS,



CAGE MACHINE WORKS,
WATERFORD, NEW YORK.

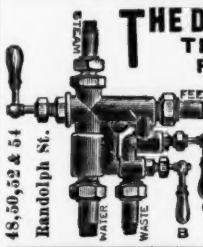
A UNIVERSAL WRENCH.
BAUER'S PAT.

SELF-ADJUSTING, SELF-GRIPPING, SELF-ACTING WRENCH, and TONGS.
Grips from Largest to Smallest size. Get List from
PAINE, DIEHL & CO., 12 BANK ST., PHILA, PA

JENKINS STANDARD PACKING
TRADE MARK

Use the JENKINS STANDARD PACKING in the worst joint you have, and if, after following directions, it is not what we claim, WE WILL REFUND THE MONEY.
Our "Trade Mark" is stamped on every sheet. None genuine unless so stamped. Send for Price List.
JENKINS BROS.,
71 John Street, N. Y. 79 Kilby Street, Boston.
13 South Fourth Street, Phila.

THE NATIONAL FEED WATER HEATER.
A brass coil heater supplying feed water at 210° to 212° Fahrenheit by use of exhaust steam. Our prices are low and reasonable, and we aim to supply the *cheapest, best and most effective Heater in the market.* Sixteen sizes. 10 H.P., $20; 100 H. P., $150; 500 H. P., $600. Iron, Brass and Copper Coils and Bends made to order. Circulars and price lists sent on application.
National Pipe Bending Co.,
NEW HAVEN, Connecticut.



THE DUPLEX INJECTOR
THE BEST BOILER FEEDER KNOWN.
Not liable to get out of order. Will lift water 25 feet. Always delivers water *hot* to the boiler. Will start when it is hot. Will feed water through a heater. Manufactured and for sale by
JAMES JENKS & CO.
Detroit, Mich.

WHITNEY'S NEW RATCHET.

Has greater range than any two ratchets made, and at the ice of one. Send for circulars.
VARIETY MACHINE CO., Warsaw, N. Y

PATENT SOLICITORS
ELLSWORTH & YANTIS,
816 F St., Washington, D.C.
Send for Circular.

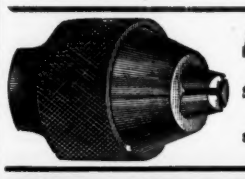
EAGLE ANVIL WORKS,
Trenton, N. J.

The Fisher Double Screw Leg Vise.—Warranted stronger grip than any other Vise. Always parallel and cannot be broken.
Send for Circulars.

The Eagle Anvil.—Best Cast Steel Face & Steel Horn. Better than any English anvil. Fully warranted and lower price.

OIL CUPS
For Engines, Shafting, &c.
Illustrated Catalogue Free.
J. E. LONERGAN & CO.
Philadelphia, Penna.

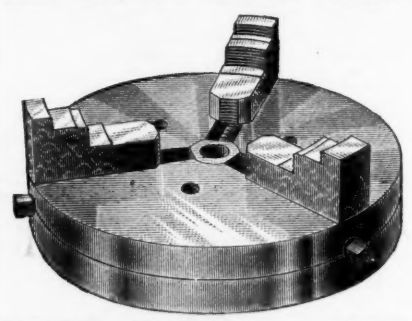
IF YOU ONLY KNEW HOW GOOD THE ELLIOTT CUTTING OFF TOOL IS,
You would not sleep until you had ordered one.
STERLING ELLIOTT, NEWTON, MASS.



Almond Drill Chuck
Sold at all Machinists' Supply Stores.
T. R. ALMOND,
83 & 85 Washington St., Brooklyn, N. Y.

UNIVERSAL RADIAL AND RADIAL DRILLING MACHINES
THREE DESIGNS. SIX SIZES.
EMBODY ALL DESIRABLE FEATURES
PRICES $450.00 & UPWARD
ADDRESS UNIVERSAL RADIAL DRILL CO
CINCINNATI, O. U.S.A.

ESTABLISHED 1851.
THE HORTON LATHE CHUCK.



THE E. HORTON & SON CO.
Canal St., Windsor Locks, Conn., U. S. A.

ROLLER TUBE EXPANDERS,
FORGED STEEL, SHEET METAL PUNCHES
SCREW PUNCHES, A. L. HENDERER,
Wilmington, Del

Experimental and New Machinery for Special Purposes
BUILT UNDER CONTRACT
From Specifications and Inventors' Designs.
AMPLE SHOP AND SHIPPING FACILITIES.
COHOES IRON FOUNDRY AND MACHINE CO.,
CORRESPONDENCE SOLICITED. COHOES, N. Y.

MINNEAPOLIS INDUSTRIAL EXPOSITION
OPENS AUGUST 23, CLOSES OCTOBER 2, 1886.

Cost $250,000; 7 1-2 acres floor space; fire-proof art gallery.

SPACE, LIGHT, POWER, etc., furnished free to Exhibitors. The Committee on Exhibits invite correspondence with manufacturers and others who desire to exhibit their goods or processes to the people of the most prosperous and best buying section of the Union.

MINNEAPOLIS has 150,000 people, and within a radius of twenty miles are over 400,000. Minnesota, Dakota, Wisconsin, Iowa, Nebraska, Manitoba and the whole northwestern section, clear to the Pacific, tributary, with over 6,000,000 population. 48,000 miles of railroads center in the city. Have had 60,000 daily attendance at Minneapolis fair

SPECIAL RATES over all roads, and the finest line of attractions that can be obtained. Negotiations nearly closed with Mexican National Band, which will draw more people than any other musical organization. Correspondence invited and full particulars furnished. W. M. REGAN,
Ch. Com. on Exhibits, MINNEAPOLIS, MINN.

TOOLS. IMPROVED POWER, OR HAND PLANER.
PLANES 27 in. long; 12 in. wide; 8 in. high.
Machinists, Engineers, Model Makers
and all classes of Mechanics can find TOOLS to suit them at Reduced Prices.
A. J. WILKINSON & CO.
184 to 186 Washington Street,
BOSTON, MASS.
CATALOGUES FREE.

Patent Flexible Back Hack Saw for Machinists' Use.

Made of best band Steel. The teeth only are hardened by an entirely new process, the back remaining soft and flexible. Warranted not to break. Send for sample and circular. Endorsed by The Pratt & Whitney Co., John Henney, Jr., Supt. Motive Power, N. Y., N. H. & H. R. R. and others.
HENRY G. THOMPSON & SONS,
New Haven, Conn. | 51 Leonard St., N. Y.

ADAMS PATENT, AUTOMATIC BOLT AND NUT THREADING AND POINTING MACHINES.
MANUFACTURED SOLELY BY
THE ADAMS & PRICE MACHINERY CO.
35 TO 41 INDIANA ST. CHICAGO. ILLUSTRATED CATALOGUE ON APPLICATION.

FRICTION CLUTCH PULLEYS AND CUT-OFF COUPLINGS.
JAS. HUNTER & SON,
North Adams, Mass.

MORSE TWIST DRILL AND MACHINE COMPANY, New Bedford, Mass
Manufacturers of Morse Patent Straight-Lip Increase Twist Drills.

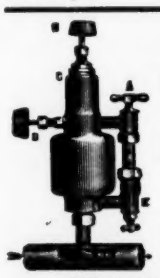
SOLID AND SHELL REAMERS, BEACH'S PATENT SELF-CENTERING CHUCK, BIT STOCK DRILLS, DRILL GRINDING MACHINES, MILLING CUTTERS AND SPECIAL TOOLS TO ORDER.

PATENT PLATE BENDING ROLLS

Made by HILLES & JONES.

THE CUT REPRESENTS ALL SIZES THAT ARE DRIVEN BY BELTS.

It is but the work of a moment to balance the top roll and lower the hinge housing to take out the plate when a full circle is bent. The rolls are all made of solid wrought iron, the balance bar being a part or extension of the top roll. There is a cast iron bed-plate under the entire machine. To save any shifting of belts we put in Friction Pulleys, which enable the rolls to be started, stopped or reversed instantly.

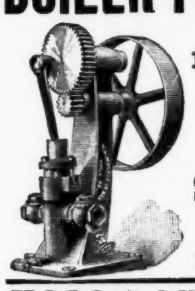


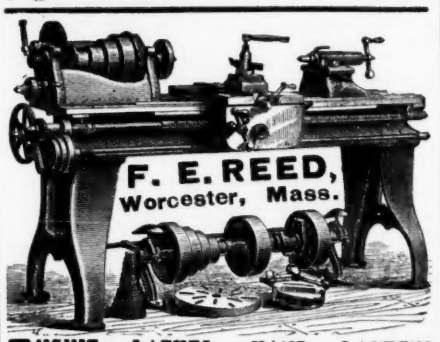
CRAIG'S
New "Class C" Lubricator
Manufactured by
The Craig Sight Feed Lubricating Co.
LAWRENCE, MASS.
Manufacturers of
Sight Feed Lubricators for Locomotives, Stationary, Marine, Portable & Pumping Engines.
WRITE FOR CIRCULAR.

DROP FORGINGS OF IRON OR STEEL
BEECHER & PECK, NEW HAVEN CONN.
PECK'S PAT. DROP PRESS.
BEECHER & PECK. NEW HAVEN CONN.

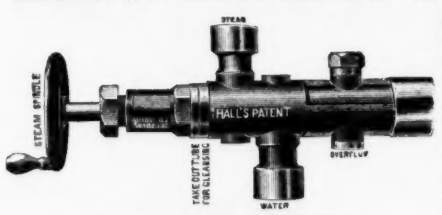
MACHINERY
For Reducing and Pointing Wire.
Especially adapted to pointing wire rods and wire for drawing.
For Machines or information, address the manufacturer.
S. W. GOODYEAR, Waterbury, Ct.

BOILER FEED PUMP
MADE BY
M. R. MUCKLE, Jr. & CO.
PHILADELPHIA,
SIZES TO SUIT STEAM PLANTS, UP TO 300 H. P.
Send For CirculaR



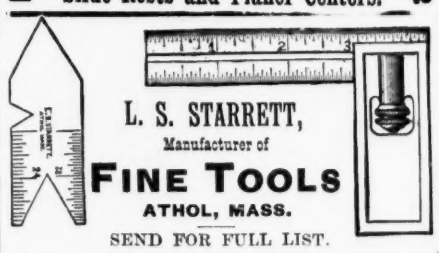


HALL'S PATENT AUTOMATIC INJECTORS



OVER 20,000 IN USE.
HALL'S ENGINEERING CO.,
112 JOHN STREET, NEW YORK.

ENGINE + LATHES, + HAND + LATHES
Slide Rests and Planer Centers.



Manufacturer of
FINE TOOLS
ATHOL, MASS.
SEND FOR FULL LIST.

No. 5 WHEEL AND PINION CUTTING ENGINE

Will Cut Brass Wheels to 5 Inches in Diameter, Spur, Bevel or Crown;
AND
STEEL PINIONS
To 1 Inch in Diam.

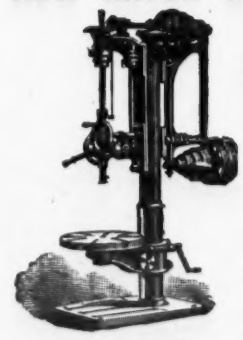
Send for Description and Prices.

SLOAN, CHACE & COMPANY
289-293 Washington St., Newark, N.J.
BUILDERS OF WATCH AND CLOCK MACHINERY.

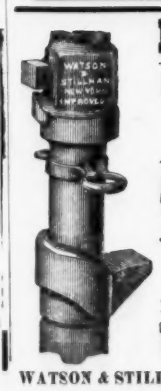
Neptune Flexible Spray Hose Pipe.
All rubber. Indestructible. Throws solid stream. Mist or spray produced, closely concentrated or widely diffused, by compressing soft rubber tip. Requires no packing. Best for gardens, carriage washing, factories, etc. By mail postpaid 1-2 and 3-4 in. 50 cts, 1 in. 75 cts., 1 1-4 in. $1. Trade supplied.
HARTFORD RUBBER WORKS,
P. O. Box 604. HARTFORD, CT.

JAMES W. SEE,
Hamilton, Ohio, U. S. A.
Acts as Solicitor of Patents, Caveats, Trade-Marks, Design-Patents, Labels, and Copyrights, foreign and domestic, reports on questions of patentability, infringement etc., and serves as expert in patent causes.

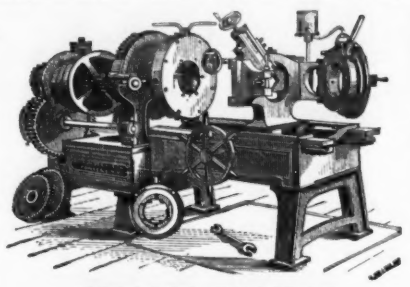
NEW HAVEN MANUF'G CO.,
New Haven, Conn.



Lathes,
Planers,
Shapers,
Slotters,
Etc.



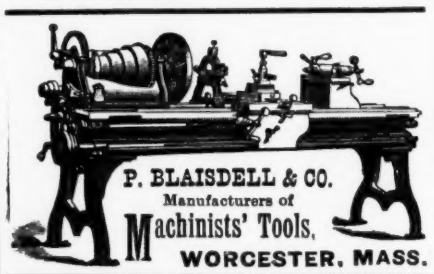
HYDROSTATIC MACHINERY,
PRESSES,
PUMPS,
PUNCHES,
ACCUMULATORS,
JACKS,
VALVES,
FITTINGS,
VAULT ELEVATORS, &c., &c.
WATSON & STILLMAN, 204-210 East 43d St., N. Y.



D. SAUNDERS' SONS,
Manufacturers of
Pipe Cutting & Threading Machines
For Pipe, Mill and Steam Fitters' Use.
TAPPING MACHINES,
For Steam Fitting, also
Steam and Gas Fitters' Hand Tools.
SEND FOR CIRCULAR.
YONKERS, N. Y.

Ferracute Machine Co.,
BRIDGETON, N. J., U.S.A.
PRESSES, DIES
and all other Sheet-Metal Tools.
A new line of **PUNCHING PRESSES** just out.
Send for Catalogue.

THOS. H. DALLETT & CO.,
13th & Buttonwood Sts., PHILA., PA.
MANUFACTURERS OF
PATENT Portable Drilling Machines,
VERTICAL DRILLS,
Radial Drills, Multiple Drills,
HAND DRILLS.
Send for Illustrated Catalogue.



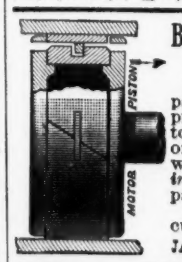
It will "Pay the Piper,"

THE AMERICAN UNION

If he aims to pipe well for STEAM, WATER, GAS, ACIDS, OILS, AMMONIA, &c., to examine this UNION, which requires no packing, but is always ready for instant use. When you next order Fittings of any Dealer, ask for a sample American Union to come with them, and it will tell you the whole story, or we will, if you write us for particulars.

PANCOAST & MAULE,
PHILADELPHIA, PA.

If you happen to take an Interest in doing First-class work about your establishment, send for a Circular of this Union.



BRANDON'S PISTON RING PACKING.
By its use a piston is self-packed against pressure, this pressure being balanced so as to permit neither the forcing of the rings *outwardly*, causing wear of rings and cylinder, nor *inwardly*, allowing the fluid to pass by them.
For License or Illustrated Circular, Address,
JAMES BRANDON, 233 Tenth Ave. N.Y.

THE CINCINNATI SCREW AND TAP CO.,
CINCINNATI, OHIO.
MANUFACTURERS OF
Send for Illustrated CATALOGUE.

Screws,
TAPS, DIES,
AND
UNIVERSAL
MILLING MACHINES.

BEVEL GEARS,
Cut Theoretically Correct.
For particulars and estimates apply to
BREHMER BROS.,
Machinists,
440 N. 12th St., Philadelphia, Pa.

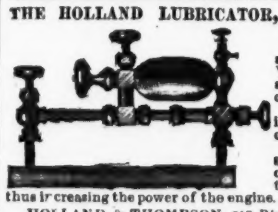
Iron and Steel
DROP FORGING
Of Every Description, at Reasonable Prices.
THE R. A. BELDEN CO., DANBURY, CT.

THE
Slate Sensitive Drill

Adapted to rapid work with small drills. Its extreme sensitiveness prevents clogging and breakage of drills. Has a swinging table with attachment for center drilling. Instantly adjustable to different lengths of work. Over 200 already in use. Send for Circular.
DWIGHT SLATE,
Hartford, Conn.

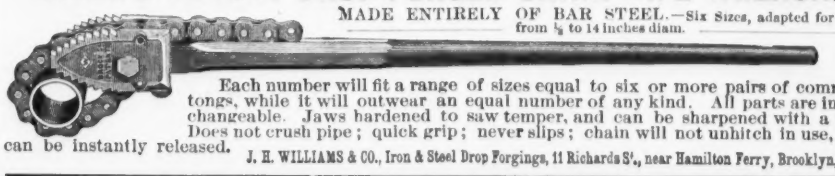
FAY & SCOTT, DEXTER, ME.
MANUFACTURERS OF
WOOD LATHES,
Drill Lathes, Shaping Machines, Milling Machines, Planer Centers, &c.
SEND FOR CATALOGUE.

THE HOLLAND LUBRICATOR, VISIBLE DROP,

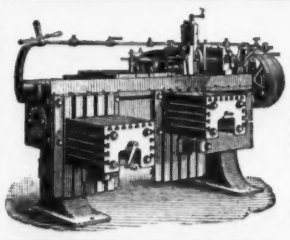


Is guaranteed to be
1. A perfect insurance against the cutting of Valve-seats, Cylinder and Governor Valves of the engine.
2. It will pay for itself in 6 months in saving of oil, coal, and packing.
3. It will insure more speed in the revolutions of the engine, say from 1 to 2 strokes per minute, thus increasing the power of the engine. Manufactured by
HOLLAND & THOMPSON, 217 River St., Troy, N. Y

BROCK'S PATENT DROP-FORGED CHAIN PIPE WRENCH.
MADE ENTIRELY OF BAR STEEL.—Six Sizes, adapted for pipe from ⅛ to 14 inches diam.

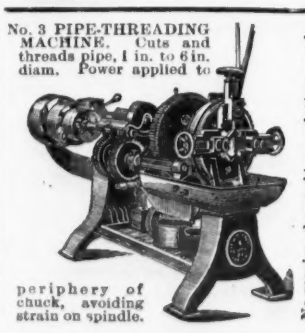


Each number will fit a range of sizes equal to six or more pairs of common tongs, while it will outwear an equal number of any kind. All parts are interchangeable. Jaws hardened to saw temper, and can be sharpened with a file. Does not crush pipe; quick grip; never slips; chain will not unhitch in use, but can be instantly released. J. H. WILLIAMS & CO., Iron & Steel Drop Forgings, 11 Richards St., near Hamilton Ferry, Brooklyn, N. Y.



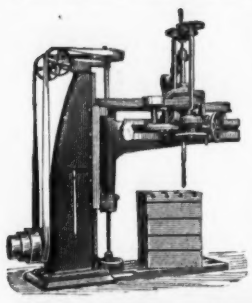
RICHARDS' PATENT
Combination Planer and Shaper.
Several sizes, any length of bed. Only the head travels, the work remaining stationary. Combines advantages of both planer and shaper. Effective, durable and convenient. A number in use, giving perfect satisfaction. Send for circular. Manufactured by
E. A. WALKER,
75 Laurel Street, Philadelphia.

No. 3 PIPE-THREADING MACHINE. Cuts and threads pipe, ¼ in. to 6 in. diam. Power applied to periphery of chuck, avoiding strain on spindle.



No gearing changed in regulating speeds. Also made with steam engine attachment when desired.

THE EATON, COLE & BURNHAM CO.
82 & 84 Fulton Street, New York,
MANUFACTURERS OF
PIPE CUTTING and THREADING MACHINES
OPERATED BY HAND OR POWER.
FITTINGS, VALVES, PIPE, PIPE TOOLS,
AND ALL STYLES OF IRON AND BRASS GOODS FOR
STEAM, WATER AND GAS.
Factory, Bridgeport, Conn.



WILLIAM SELLERS & CO., ENGINEERS AND MANUFACTURERS OF

IMPROVED MACHINE TOOLS FOR WORKING IRON AND STEEL

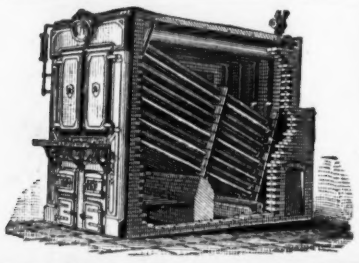
STEAM HAMMERS, PUNCHES and SHEARS, BENDING ROLLS, LATHES, PLANERS, BORING and TURNING MILLS, DRILL AND TOOL GRINDERS, Etc., Etc.

SHAFTING, PULLEYS, HANGERS, COUPLINGS, Etc.

IMPROVED INJECTORS FOR FEEDING BOILERS.

PAMPHLETS, PHOTOTYPES AND PRICES FURNISHED ON APPLICATION TO

OFFICE AND WORKS, PHILADELPHIA, PENNA.



ROOT'S NEW WATER-TUBE STEAM BOILER

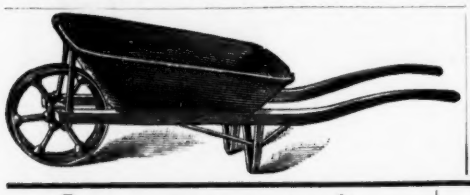
SAFE! ECONOMICAL! DURABLE

For ILLUSTRATED CATALOGUE of NEW BOILER, Address

ABENDROTH & ROOT MANUFG. CO.

—28 CLIFF STREET, NEW YORK.—

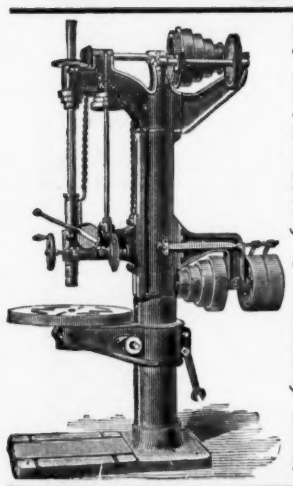
THE NEW YORK SUPPLY CO., Limited.



RAILWAY, MACHINISTS' ENGINEERS' MILL AND MINERS' Supplies

HEADQUARTERS FOR STEEL BARROWS

50, 52 John St. NEW YORK



UPRIGHT DRILLS

A SPECIALTY,

ALL SIZES WITH PATENT QUICK RETURN-FEED AND ALL MODERN IMPROVEMENTS,

H. LICKFORD, Cincinnati, Ohio.

DRAWING INSTRUMENTS

Send for 72-Page ILLUSTRATED CATALOGUE.

WM. T. COMSTOCK, 6 Astor Place, - New York.

TO STEAM BOILER USERS.

We want all interested to know that the

LOWE BOILER

Is the best wearing boiler ever introduced, and with its IMPROVEMENTS, working under best conditions, the most ECONOMICAL of any fuel, and meets the expectations of a LARGER PERCENTAGE of its users than any other boiler.

Some LARGE CONCERNS have from FIVE to TWENTY of these BOILERS in use, and continue to add more.

☞SEE CUT OF BOILER, in *Next Issue*, and write for

HISTORY of STEAM BOILERS,

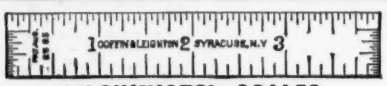
Which will be sent free to persons mentioning this paper.

WILLIAM LOWE,

PATENTEE AND SOLE MANUFACTURER,

BRIDGEPORT BOILER WORKS

BRIDGEPORT, CONN.

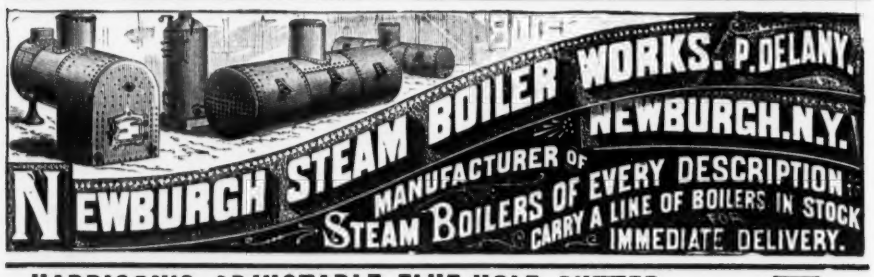


MACHINISTS' SCALES,

Patent End Graduation.

We invite comparison for accuracy with all others. Every Scale Guaranteed. Send for List.

COFFIN & LEICHTON, SYRACUSE, N. Y.



NEWBURGH STEAM BOILER WORKS. P. DELANY, NEWBURGH, N.Y.

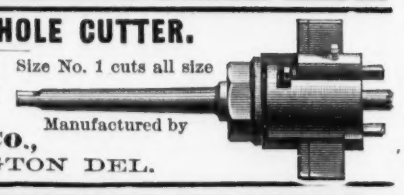
MANUFACTURER OF STEAM BOILERS OF EVERY DESCRIPTION

CARRY A LINE OF BOILERS IN STOCK FOR IMMEDIATE DELIVERY.

HARRISON'S ADJUSTABLE FLUE-HOLE CUTTER.

An effective labor-saving tool for the boiler shop. holes from 2 to 5 inches inclusive. The cutters proper are forged from ⅝-inch round steel, can be renewed at trifling cost; are easily adjusted and firmly held.

Size No. 1 cuts all size

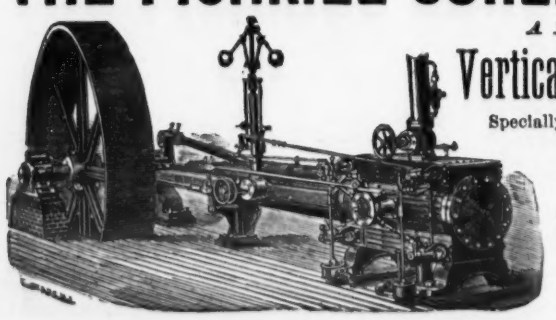


Manufactured by

REMINGTON & CO., WILMINGTON DEL.

THE FISHKILL CORLISS ENGINE,

A FULL LINE OF SIZES.



Vertical Condensing Engines

Specially adapted for and extensively used in large grain elevators.

BOILERS.

Manufactured by the

Fishkill Handing Machine Co.

FISHKILL-ON-THE-HUDSON, N.Y.

Send for Catalogue A, containing Illustrated Descriptions and References

Southwark Foundry & Machine Co.

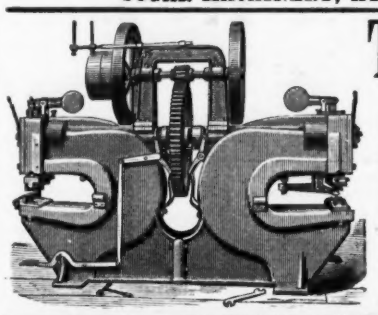
ENGINEERS AND MACHINISTS.

WASHINGTON AVE. AND FIFTH ST., PHILADELPHIA, PA.

PORTER-ALLEN and SOUTHWARK ENGINES, BOILERS AND TANKS,

BLOWING ENGINES, PUMPS, GAS APPARATUS, BESSEMER CONVERTERS, ETC.,

SUGAR MACHINERY, HYDRAULIC MACHINERY, ETC., ETC.



THE LONG & ALLSTATTER CO., Hamilton, OHIO.

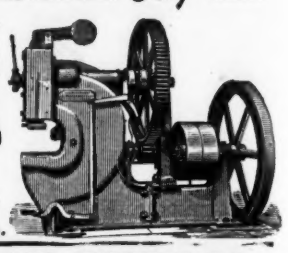
Double, Single, Angle-Bar, Gang, Horizontal, Twin, Boiler, Spacing, Gate, Multiple, Belt and Steam-Driven

Punches and Shears,

Over 300 Sizes.

ALSO,

Power Cushioned Hammer.



Send for new catalogue.

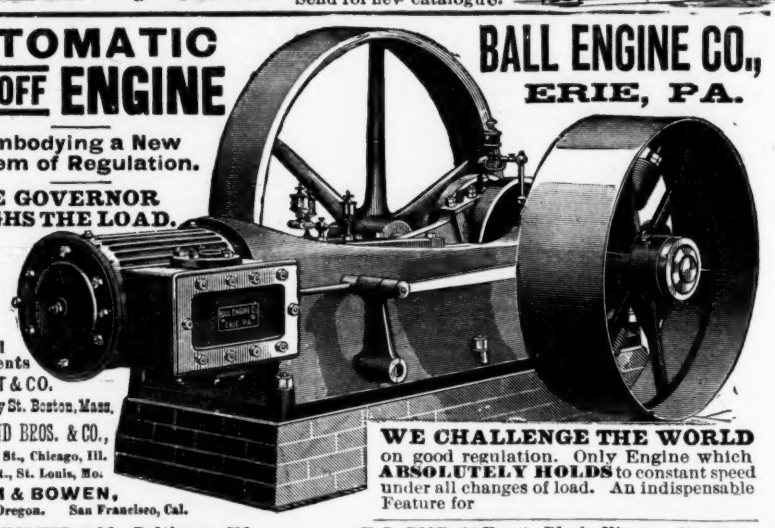
AUTOMATIC CUT-OFF ENGINE

BALL ENGINE CO., ERIE, PA.

Embodying a New System of Regulation.

THE GOVERNOR WEIGHS THE LOAD.

Send for Circular



General Sales Agents

S. L. HOLT & CO. 67 Sudbury St. Boston, Mass.

KINGSLAND BROS. & CO., 28 S. Canal St., Chicago, Ill. 823 N. 2d St., St. Louis, Mo.

TATUM & BOWEN, Portland, Oregon. San Francisco, Cal.

CROOK, HORNER & CO., Baltimore, Md.

WE CHALLENGE THE WORLD on good regulation. Only Engine which ABSOLUTELY HOLDS to constant speed under all changes of load. An indispensable Feature for

V. L. RICE, 66 Kasota Block, Minneapolis, Minn.

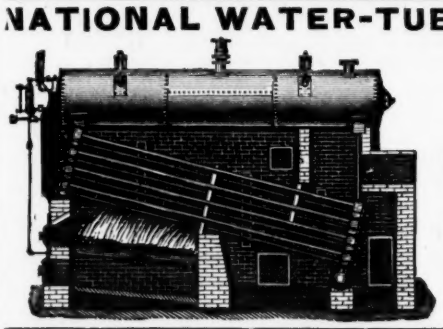
CHARLES MURRAY ENGRAVER ON WOOD 58 ANN ST. NEW YORK.

PATENTS E. B. STOCKING, ATTY. Opp. Pat. Of. Washington, D.C. Send sketch for free report as to patentability and new book on Patents.

NATIONAL WATER-TUBE BOILER COMPANY.

Main Office,

New Brunswick, N. J.



Manufacturers of

MOORE'S SYSTEM

WATER-TUBE STEAM BOILERS,

Unequalled for

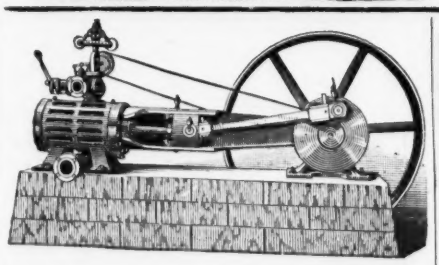
SAFETY, ECONOMY AND DURABILITY.

Branch Offices:

New York City, 64 Cortlandt St.

Philadelphia, Pa., 49 N. 7th St.

Boston, Mass., - 50 Oliver St.



STEARNS MFG. COMPANY,

ERIE, PA.

Engines from 15 to 400 Horse Power.

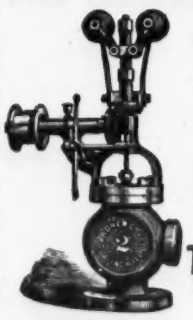
Boilers of Steel and Iron supplied to the trade or the user. Send for Catalogues.

SAW MILLS and GENERAL MACHINERY.

Works at ERIE, PA.

PATENTS THOS. P. SIMPSON, Washington, D. C. No pay asked for patents until obtained. Write for Inventor's Guide.

THE GARDNER GOVERNOR



Over 40,000 in Use.

ADAPTED TO EVERY STYLE OF STATIONARY AND PORTABLE STEAM ENGINE.

Warranted to give satisfaction or no sale.

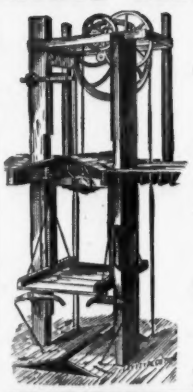
FOR CIRCULARS AND PRICES, ADDRESS,

The Gardner Governor Co.

QUINCY, ILL.

I. W. COLBURN & Co. FITCHBURG, MASS. 100 MAIN ST. ARC AND INCANDESCENT LIGHTING AND PLATING MACHINES. LOWEST LIVING PRICES

MORSE ELEVATOR WORKS.



Morse, Williams & Co.,

(Successors to Clem & Morse,)

Builders of all Kinds of

PASSENGER & FREIGHT

Elevators

Office, 411 Cherry St.

Works, Frankford Ave., Wildey and Shackamaxon Sts.,

PHILADELPHIA

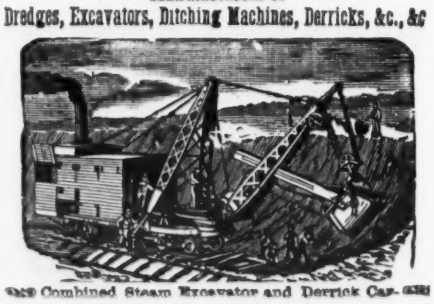
New York Office, 108 Liberty St.

OSGOOD DREDGE CO., ALBANY, N. Y.

RALPH R. OSGOOD, Pres. JAMES H. BLESSING, Vice-Pres. JOHN E. HOWE, Secretary and Treasurer.

Manufacturers of

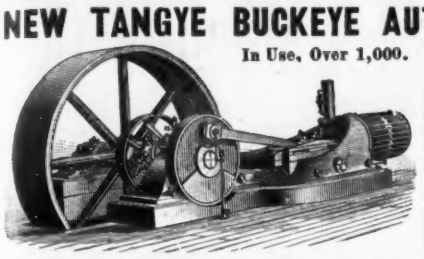
Dredges, Excavators, Ditching Machines, Derricks, &c., &c.



Combined Steam Excavator and Derrick Car.

NEW TANGYE BUCKEYE AUTOMATIC CUT-OFF ENGINES.

In Use, Over 1,000. 25 to 1,000 H.P.

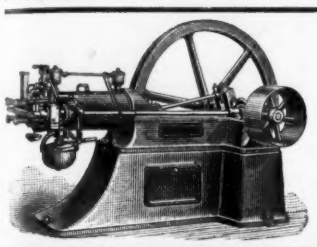


These Engines are the combined result of long experience with automatic cut-off regulation, and most careful revision of all details. They are designed and constructed for heavy and continuous duty at medium or high rotative speeds. Highest attainable Economy in Steam Consumption and superior regulation guaranteed. Self-contained Automatic Cut-off Engines, 12 to 100 H.P., for driving Dynamo Machines *a specialty*. Illustrated Circulars, with various data as to practical Steam Engine construction and performance, free by mail. Address, BUCKEYE ENGINE CO., Salem, Ohio.

SALES AGENTS, W. L. SIMPSON, 70 Astor House, N.Y. { N.W. ROBINSON, cor. Clinton & Jackson Sts. Chicago, Ill. ROBINSON & CARY, St. Paul, Minn. PRAY MFG. CO., Minneapolis, Minn.

KENSINGTON ENGINE WORKS, LIMITED, PHILADELPHIA,

Sole Licensees and Manufacturers for New Jersey (south of Trenton), Eastern Pennsylvania, Delaware, Maryland and Virginia.



"OTTO" GAS ENGINE WORKS,

SCHLEICHER, SCHUMM & CO.,

33d and Walnut Sts. PHILADELPHIA. Branch Office, 130 Washington St. CHICAGO.

OVER 18,000 ENGINES IN USE.

GUARANTEED To Consume 25 to 75 Per Cent. Less Gas than ANY Other Gas Engine per Brake-horse-power.

HEWES & PHILLIPS Iron Works.

IMPROVED

Corliss Engine,

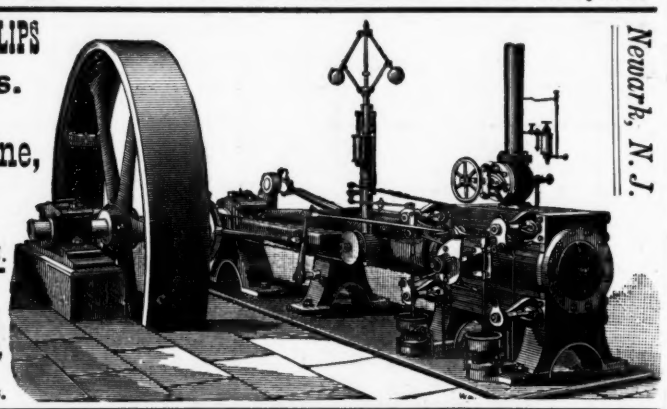
High Pressure,

—Condensing—

And Compound.

Send for Circular.

Kendall & Roberts, Cambridgeport, Mass. EASTERN AGENTS.



Newark, N. J.

THE BECKETT & McDOWELL MFG. CO.,

STEAM ENGINES, HOISTS, PUMPS

AND GENERAL MINING MACHINERY.

120 LIBERTY ST., NEW YORK.

☞ SEND FOR ILLUSTRATED CATALOGUE.

THE PARKER GASOLINE AND GAS ENGINE.

SIMPLE! NO SMOKE! DURABLE!

SAFE! NO FLAME! EFFECTIVE!

NO MATCHES USED!

NO SLIDE VALVE!

Unsurpassed economy in use of Gas. One turn of the fly-wheel, acting upon the small dynamo, creates an electric spark sufficient to start the engine running.

Sizes, 2 to 10 horse-power. Send for Illus. Circular.

YONKERS MFG. CO. SALESROOMS: 16 Dey St., N.Y.

BUILDER OF

BOILERS, GAS HOLDERS, GAS GENERATORS,

Henry Warden,

GERMANTOWN JUNC., PHILADELPHIA.

Successor to WARDEN & MITCHELL.

TANKS, STILLS, BRIDGES, Etc., Etc.

HYDRAULIC RIVETING PLANT AND FULL FACILITIES.

MACHINERY,

New and Second-Hand.

12	in. S.,	5 ft.	Bed	Engine	Lathe, New
15	"	6 ft.	"	"	" Lathe & Morse.
16	"	6 ft.	"	"	" Ames.
16	"	8 ft.	"	"	" Bridgep't. n'ly new
15	"	6 ft.	"	"	" P. & W.
17	"	6 ft.	"	"	" Putnam, not screw cutting.
17	"	6', 7'		"	" Hewes & Phillips.
18	"	8 ft.	"	"	" Fitchburg, g. o.
18	"	8 ft.	"	"	" New Haven, g. o.
25	"	10 ft.	"	"	"
24	"	14 ft.	"	"	" Ames, nearly new.
24	"	20 ft.	"	"	" Ames, new.
26	"	16 ft.	"	"	" Perkins a 1.
28	"	18 ft.	"	"	" Chain feed Screw Cutting, Cheap
20	in. Drill				Prentice Bros.

Also other smaller drills.

25, 60 and 100 lb. Bradley Hammer.
200 lb. Steam Hammer, Miles.
Nos. 2 and 4 Stiles Punch Presses.
No. 6 Wilder " "
No. 4 Long & Allstatter Punch Press.
6 in. Shaper, Gould.
20 in. shaper, G. & E., new.
12 in. " New Haven, good order.
24 in. " B'port. new.
20 in. x4 ft. Planer, New Haven.
20 in. x6 ft. Planer. Whitcomb.
20 in. x 6 ft, Planer, Pratt & Whitney.
26 in. x6 ft. " Putnam.
26 in. x6 ft. " Powell, new.
50-inch Vertical Boring Mill Phila.

also a line of Milling Machines, Screw Machines, Bolt Cutters, &c. WRITE AND STATE WHAT YOU WANT TO PURCHASE.

E. P. BULLARD,

14 Dey Street, New York City.

BLESSING'S PATENT RENEWABLE-SEAT Stop and Check Valves.

The renewable Seats and Discs are cast from the best Phosphor Bronze Metal, which has lasting qualities, double that of the best Steam Metal commonly used in first-class valves. The Seats are simply dropped into place and held in position by bottom of cage.

We also manufacture the Albany Bucket and Gravitating Steam Traps.

ALBANY STEAM TRAP CO., Albany, N.Y.

ESTABLISHED 1855

Standard Watchman's Clock, With Safety Lock Attachment.

20 PRIZE MEDALS AWARDED.

To control watchmen in manufacturing establishments, public buildings, warehouses, etc. Simplest, strongest, cheapest and most complete of its kind.

Price, with 12 keys, complete, $50. Send for circular.

O. E. HAUSBERG, Sole Agent, 71 Nassau Street, Room 3, N. Y.

FOOT POWER MACHINERY

LATHES, SAWS, etc.

Practical Workshop.

Outfits for Iron or Wood-workers, Amateur Tools, &c. Send for Catalogue.

J. J. WATROUS, 213 Race St., Cincinnati, O.

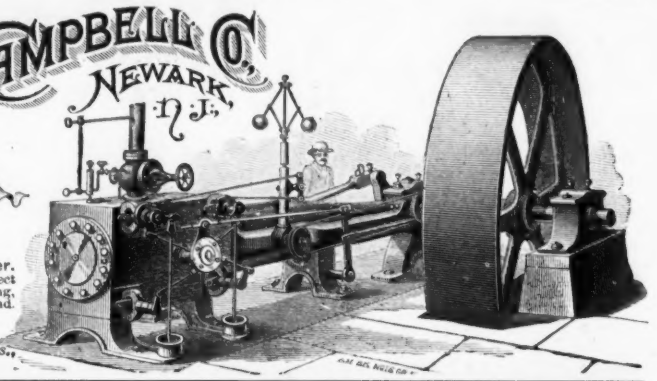
The Watts, Campbell Co.

NEWARK, N.J.

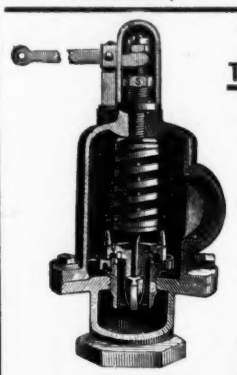
MANUFACTURERS OF IMPROVED CORLISS STEAM ENGINES IN FULL VARIETY.

Sizes varying from 30 to 2000 Horse Power. Horizontal or Vertical, Direct Acting or Beam, Condensing, Non-Condensing or Compound. Send for Circular.

BRANCH OFFICE: Cor. 5th and Chestnut Sts., PHILADELPHIA, PA.



CHAS. A. MOORE, Prest. MARTIN LUSCOMB, Treas. GEO. W. RICHARDSON, Supt.



THE CONSOLIDATED SAFETY VALVE COMPANY

CAPITAL, - - - - - $100,000

MANUFACTURERS OF

THE ONLY NICKLE-SEATED "POP" SAFETY VALVE.

☞ Approved by U. S. Board of Steamboat Inspectors. Adopted by U. S. Navy in all the Steel Cruisers. ☜

IT WILL ALWAYS PAY DEALERS, BOILER-MAKERS, AND OWNERS OF BOILERS, TO ADDRESS US FOR CATALOGUE AND PRICES BEFORE PLACING ORDERS FOR ☞ "POP" ☜ SAFETY VALVES.

SALESROOM, 111 LIBERTY STREET, NEW YORK, WORKS, BOSTON, MASS.

Dickson Manufacturing Co.

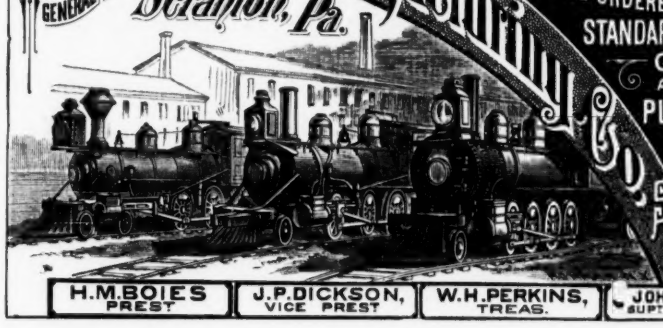
GENERAL OFFICE Scranton, Pa.

LOCOMOTIVES OF EVERY STYLE AND SIZE MADE TO STANDARD GAUGES AND TEMPLETS, SO THAT PARTS ARE INTERCHANGEABLE AND MAY BE ORDERED BY NUMBER.

STANDARD AND NARROW GAUGE.

ALSO FOR PLANTATIONS, MINES AND LOGGING.

Specifications on Application.



H. M. BOIES, PREST | J. P. DICKSON, VICE PREST | W. H. PERKINS, TREAS. | JOHN DEVINE, SUPT LOCO. DEPT

STEEL CASTINGS

From 1-4 TO 15,000 lbs. WEIGHT.

True to Pattern, sound, solid, free from blow-holes and of unequaled strength.

Stronger and more durable than iron forgings in any position or for any service whatever.

40,000 CRANK SHAFTS and 30,000 GEAR WHEELS of this steel now running prove this.

Cross-Heads, Rockers, Piston-Heads, etc., for Locomotives.

STEEL CASTINGS of every description.

Send for Circulars and Prices to

CHESTER STEEL CASTINGS CO.,

Works, Chester, Pa. Office, 407 Library St., Phila. Pa.

W. C. YOUNG & CO., Worcester, Mass., Manufacturers of Engine Lathes, Hand Lathes,

FOOT POWER LATHES, SLIDE RESTS, Etc.

EXTRA HEAVY LATHE

WE ARE MAKING A SPECIALTY OF A 24-INCH LATHE, WITH BED ANY LENGTH DESIRED. THIS LATHE IS DESIGNED FOR SEVERE SERVICE; IT IS THE HEAVIEST OF ITS SIZE EVER PRODUCED, AND THE WORKMANSHIP AS GOOD AS SKILL CAN MAKE IT.

SEND FOR CIRCULAR.

S. S. HEPWORTH & CO., "Glenwood Station," Yonkers, N. Y.

THE BABCOCK & WILCOX CO.

WATER TUBE STEAM BOILERS.

30 CORTLANDT STREET, NEW YORK.

107 HOPE STREET, GLASGOW, SCOTLAND.

Branch Offices:

BOSTON, 50 Oliver Street.
PHILAD'PHIA, 32 N. 5th Street.
CHICAGO, 64 S. Canal Street.
NEW ORLEANS, 54 Carondelet Street.
SAN FRANCISCO, 561 Mission Street.
HAVANA, 50 San Ignacio.

Send to nearest Office for Circular.

THE SKINNER ENGINE CO.

ERIE, PA.

PORTABLE AND STATIONARY

ENGINES and BOILERS

Send for Catalogue and Prices.

S. ASHTON HAND MFG. CO.,

Toughkenamon, Chester Co., Pa.

MAKERS OF FIRST-CLASS

ENGINE LATHES

Are now in position to put on the market

14" ENGINE LATHES OF NEW DESIGN,

guaranteed to be equal in material, design and workmanship to the best ever offered.

SEND FOR SPECIAL LIST.

New and Second-hand Machinery.

COLD-ROLLED SHAFTING, HANGERS, PULLEYS, ETC., ETC.

GEORGE PLACE MACHINERY CO.

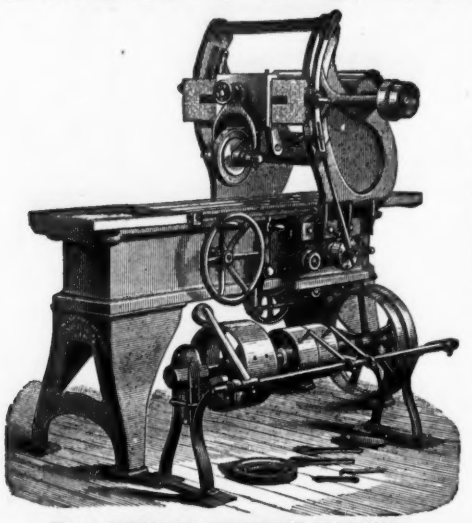
121 Chambers St., New York.

BROWN & SHARPE MFG. CO.

Manufacturers of

MACHINERY AND TOOLS,

PROVIDENCE, R. I.



No. 3 SURFACE GRINDING MACHINE.

This Machine is designed for flat and true surface grinding and finishing. It is an effective substitute for the operations of filing and stoning. The entire cost of files, and three-quarters of the labor usually expended on these operations are saved, beside obtaining better surfaces upon the work done. For all finished parts of machinery of cast iron or steel, hard or soft, for punches or dies, straight edges, flattening dies, etc., it will prove invaluable, and will produce fine work with little expense.

It will Grind 14″ wide, 36″ long, 10″ high, using a 9″ wheel.

The countershaft has tight and loose pulleys 8″ diam., 4″ face, and should run about 276 turns per minute.

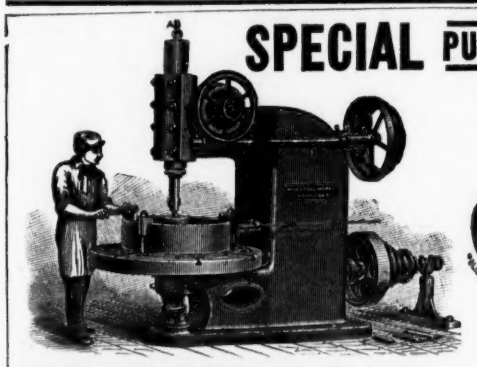
Price includes countershaft, wrenches, etc., all complete, delivered F. O. B. at Providence, R. I. Weight, 2,500 lbs.

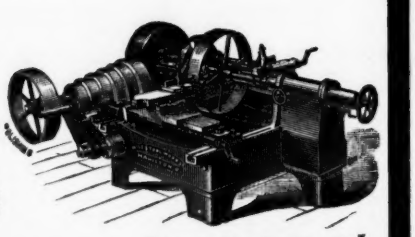
We are prepared to furnish this machine lengthened, to grind 5 ft. long. Weight, 3,000 lbs.

ILLUSTRATED CATALOGUE MAILED ON APPLICATION.

SPECIAL PULLEY MACHINERY.

36, 50 & 60 in. Swing.





NILES TOOL WORKS, Hamilton, O. Chicago, March 19th, 1883.

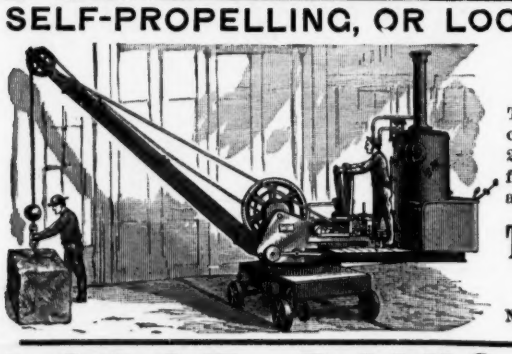
Gentlemen:—We have been using continuously for the past two years the **FIFTY-INCH PULLEY MACHINES** purchased of you, and they have not cost us a cent in the way of repairs. We have turned out as high as **19 pulleys ranging from 20 to 28 inches in diameter and from 6 to 8 inches face in 10 hours. Have turned 8 pulleys 48 x 8 inches in 10 hours.**

The manufacture of pulleys comprises quite a large part of our business, and we looked over the field considerably before purchasing of you, and this, with two years' experience, enables us to say, we think them **THE BEST PULLEY MACHINES** in the market.

Very truly yours, **W. McGREGOR & CO**

SELF-PROPELLING, OR LOCOMOTIVE CRANES.

HOIST, ROTATE AND TRAVEL UNDER THEIR OWN STEAM.



The most generally useful Crane for shops, contractors, steel mills, etc. All capacities, 2 and 5-ton sizes usually in stock. Send for particulars and illustrated catalogue of all types of cranes.

The Yale & Towne Mfg. Co.,

STAMFORD, CONN.

New York, Chicago, Philadelphia, Boston.

LODGE, DAVIS AND COMP'Y

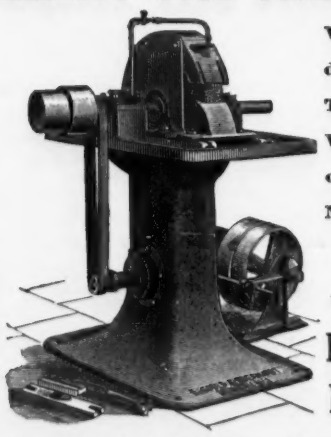
MANUFACTURERS & DEALERS IN **MACHINE TOOLS**

CINCINNATI, OHIO,

PLANERS, **ENGINE LATHES,**
SHAPERS, **FOX MONITORS,**
20 in. to 32 in. **UPRIGHT DRILLS,** **SPEED LATHES,**
VALVE MILLERS, **MILLING MACHINES.**

☞ ALL FOR IMMEDIATE DELIVERY. WRITE FOR PRICES BEFORE BUYING.

EBERHARDT'S EMERY TOOL GRINDER



Will not draw the Temper. Will ship on its Merits.

Write to E. Gould & Eberhardt

97 to 111 N. J. R.R. Ave., Newark, N. J.

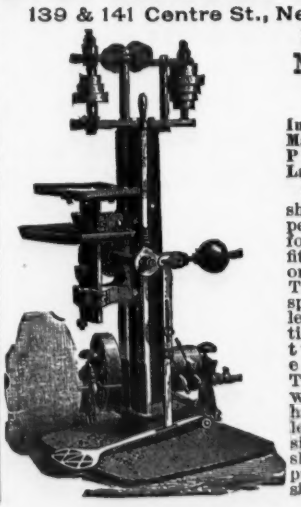
E. E. GARVIN & CO.,

139 & 141 Centre St., New York,

Manufacturers of

Machinists' Tools,

Including Milling Machines, Drill Presses, Hand Lathes, &c.



The machine shown in cut, is especially designed for jobbing, and is fitted up with one or two spindles. Those with two spindles have pulley, with two sections, which gives two speeds to each spindle. Those fitted up with one spindle have a cone pulley with three sizes. The back shaft has a cone pulley with four sizes.

THE PRATT & WHITNEY CO.,

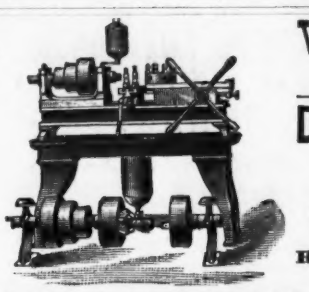
HARTFORD, Connecticut.

MANUFACTURE

HORIZONTAL

Boring Mills,

48 in. and 66 in. Swing.



Double Head Traverse Drills

For ⅝ in., 3 in. and smaller holes.

Revolving Head Drilling Machines.

Monitor Head Lathes and Screw Machines, Screw Slotting and Shaving Machines, Rifling Machines, Spring Coiling Machines.—Price List and Description furnished on Application.

THE BILLINGS & SPENCER CO., Hartford, Ct., U. S. A.

MANUFACTURERS OF

BILLINGS' DOUBLE-ACTING RATCHET DRILL

For Morse Taper Shank Drills.

Packer Ratchet Drills,
Packer Boiler Ratchet Drills,
Packer Auger Ratchet Drills.

DROP FORGINGS

OF EVERY DESCRIPTION.

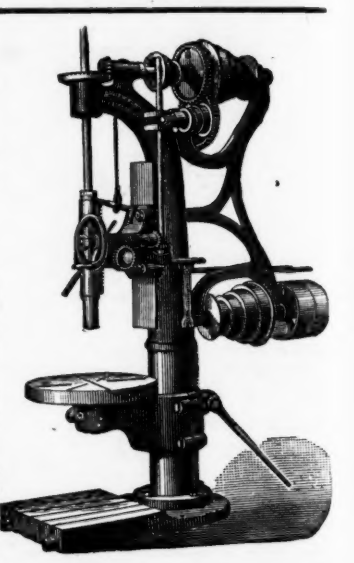
Vertical Milling Machine.

WARNER & SWASEY,

CLEVELAND, OHIO.

Machine Tools FOR **IRON & BRASS WORK.**

Send for Illustrated Catalogue.



Engine Lathes, Planers, Drills, &c.

Successors to **David W. Pond,**

WORCESTER, MASS.

New Designs, Quick Delivery, Great Variety.

GEO. W. FIFIELD,

MANUFACTURER OF

ENGINE LATHES

FROM 16 to 48 IN. SWING.

Cuts, Photographs and Prices furnished on application.

Lowell, Mass., U. S. A.

J. M. ALLEN, PRESIDENT.

W. B. FRANKLIN, VICE-PRESIDENT.

J. B. PIERCE, SECRETARY.

GEAR WHEELS AND GEAR CUTTING.
Send for Catalogue D.

G. B. GRANT,

666 Beverly St., Boston, Mass.

KEY SEATING MACHINES AND 20 in. Drills a specialty.

Our 20 in. Drill is a heavy substantial tool, made for service, has steel shafts and spindle. Gears and racks cut from the solid and have all modern improvements, are made by special machinery, and sold very low.

Our Key Seating Machine will save enough in 60 days' use to pay first cost; no shop can afford to do without one. We have now ready for prompt shipment, both Key Seat Machines and 20 in. Drills. Send for Photo. and Catalogue.

W. P. DAVIS, North Bloomfield, N.Y.

For New Reduced PRICE LIST, Write to

G. A. Gray, Jr. & Co.,

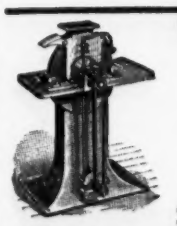
42 E. 8th ST., CINCINNATI, O.

LATHES, 17 in. 20 in.

PLANERS, 24″x24″ 30″x30″

THE BUFFALO STEEL FOUNDRY, BUFFALO, N. Y.

ORDERS AND CORRESPONDENCE SOLICITED. | PRATT & LETCHWORTH Proprietors.



The Stiles Machinist Tool Grinder.

FOR GRINDING LATHE, PLANER AND OTHER TOOLS,

—MANUFACTURED BY—

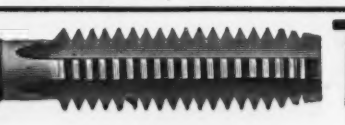
THE STILES & PARKER PRESS CO.

MIDDLETOWN, CONN.

Branch Works and Office:

203, 205, 207 Centre Street, corner of Howard, New York.

J.M. CARPENTER PAWTUCKET, R.I.



Manufacturer of TAPS AND DIES